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Agricultural Economics RESEARCH

Contents for JANUARY 1949 — *Vol.* I, *No.* 1

		Page
Notes on the New Journal	*O. V. Wells*	1
Design of Samples for Surveys	*Earl E. Houseman*	3
Parity Prices	*C. Kyle Randall*	11
Interviewing Non-respondents to a Mail Survey	*J. C. Scholl* and *C. E. Burkhead*	16
Agriculture and Strip Coal Mining	*George H. Walter*	24

Book Reviews by *D. B. DeLoach, O. V. Wells, James P. Cavin,* and *Howard L. Parsons*

UNITED STATES DEPARTMENT OF AGRICULTURE • Bureau of Agricultural Economics

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Contributors

Contributors are on the staff of the Bureau of Agricultural Economics unless otherwise stated

O. V. Wells, with this initial issue of this journal, realizes a hope which he has held since becoming Chief of BAE in May 1946.

Earl E. Houseman had 5 years of study, research, and teaching in the Statistical Laboratory at Iowa State College after taking his master's degree in mathematics at the University of South Dakota. He is now statistical consultant in the Office of the Chief. This paper grew out of a talk he gave before the Conference on Statistics Applied to Research, held at Auburn, Ala., last September.

C. Kyle Randall is head of Statistics Service Section, Division of Statistical and Historical Research. He furnished a good deal of the statistical material that was used in the development of the new parity-price formula. At the request of the Senate subcommittee in charge of the bill, he was on the floor of the Senate on June 16 and 17, when the bill was being debated there, to supply Senators with any necessary statistical information in regard to it. The bill was passed by the Senate on June 17 and became title II of the Agricultural Act of 1948.

J. C. Scholl, formerly engaged in climatological work with the Weather Bureau and the Navy, is now on the staff of Agricultural Estimates, working primarily on feed grains in the Field Crops Division. C. E. Burkhead is the head of this Division supervising several such projects and the estimation of field crops.

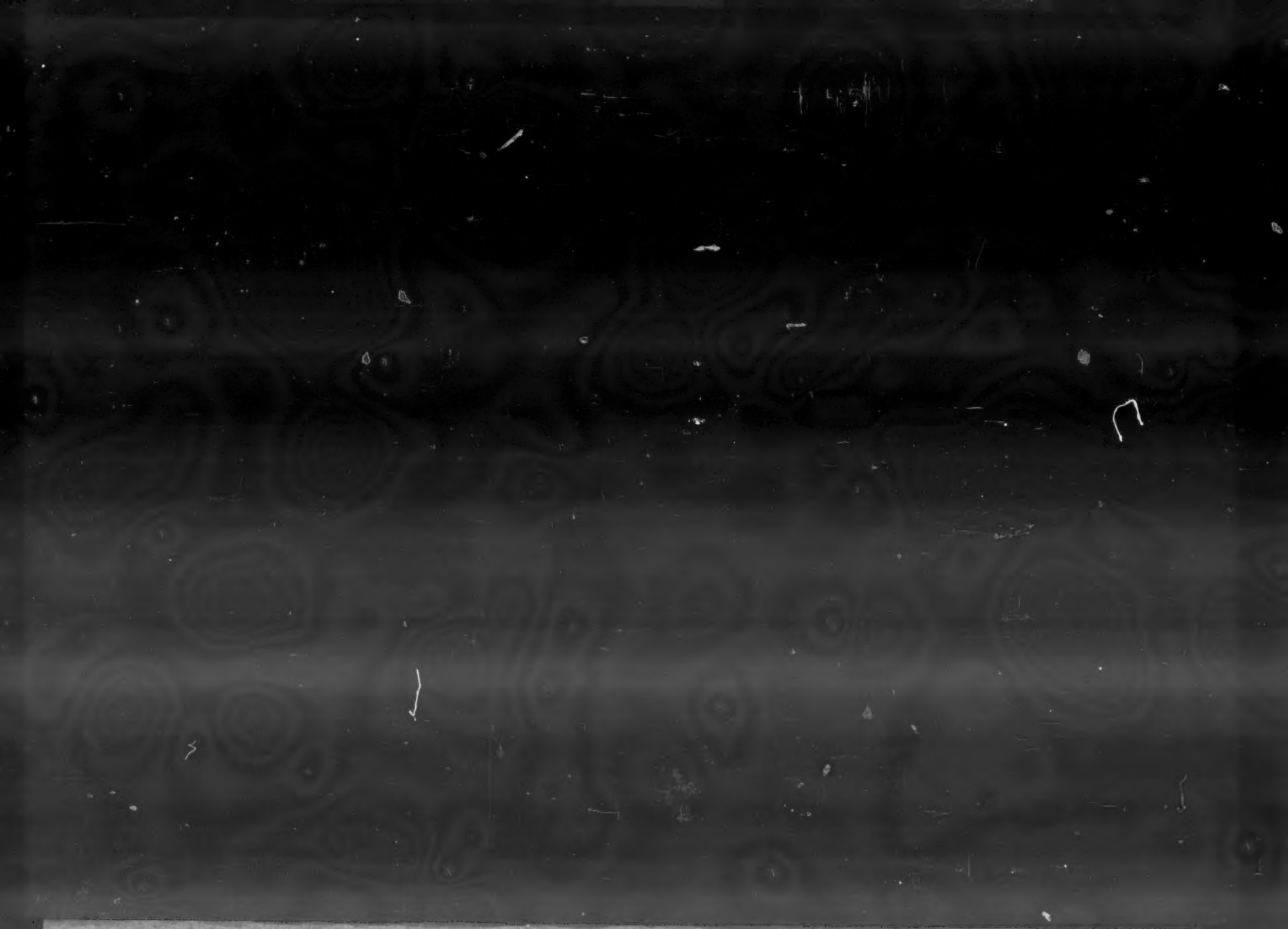
George H. Walter grew up in a strip coal-mining area in Illinois. While working as an agricultural economist with the Division of Land Economics he has been stationed in Illinois, Missouri, and Wisconsin, and has had opportunity to observe strip-mining activities in most of the major open-cut mining areas in the Midwest.

James P. Cavin is Head of the Division of Statistical and Historical Research in which are made all of the Bureau's analyses of the supply and demand situations in regard to food and related agricultural products.

D. B. DeLoach, on sabbatical leave from Oregon State College, is acting as consultant to the Chief of BAE and is actively directing the new costs and margins research under the Research and Marketing Act.

Howard L. Parsons, after 2 years' educational leave at Harvard, is assigned to the Office of the Chief to help in the integration and coordination of economic research in the Department. His task as joint editor of this journal is an integral part of his larger assignment.

Editors: Howard L. Parsons
Caroline Sherman



AGRICULTURAL ECONOMICS RESEARCH

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Agricultural Economics Research: Some Notes on the New Journal

By O. V. Wells

SOME OF US have felt for a long time that the Bureau of Agricultural Economics needed some medium for the publication of technical articles. Surely such a journal should prove as useful to agricultural economists and statisticians as similar journals have proved in other fields, such as commerce, labor, or for general agriculture, the *Journal of Agricultural Research*.

We intend that this be such a journal.

Editorial policy has not as yet necessarily crystallized. However, some tentative rules were suggested in a memorandum circulated to the field employees of the BAE under date of November 8. This memorandum indicated that we expect the journal to carry signed articles of 5,000 words or less falling within any of three general fields:

First, and most important from the viewpoint of space, we will publish articles that report on the results or findings of research carried forward within the Bureau. These articles may be in the nature of interim reports on work in progress or, on occasion, statements that actually terminate the project. Partly because of limited printing funds and partly because of the time consumed in preparation, the bulletins through which we publish many of our research findings are delayed. This new journal should be of service in speeding up the dissemination of our technical findings. Almost every leading line of work within the Bureau should turn up some new or significant result which would warrant consideration of an article from time to time.

Second, we will publish articles on new research methods or techniques that are being developed, as well as critical discussons of old techniques that are in regular use. As the reading audience will be primarily professional, we shall occasionally publish articles on methods or techniques which are designed to elicit or encourage discussion at the technical level.

Third, we will publish articles on new or expanding areas of research or statistical fact-gathering. Over and above any discussions of techniques that these articles may include, they should cover the probable usefulness of such new developments as well as the place of such new areas of work in the agricultural field.

Although all Bureau representatives are invited to submit articles in any of these three fields, we believe that State statisticians and members of their staffs should be an especially fruitful source for items falling within the second general field. We are continuously engaged in studying ways and means of improving the usefulness and reliability of the data collected through Agricultural Estimates. A considerable number of our inquiries and their results in this field often remain relatively unknown, especially to individuals outside the Service. Since the information collected and published as a result of our statistical work is so widely used, it is desirable to acquaint agricultural economists and statisticians generally with any improvements. Each issue of this journal should carry a couple of articles of this kind.

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As we are anxious to carry discussions relating to all the work for which we are responsible, we shall consider articles from workers who are cooperating, or working under contract, with the Bureau. Such articles can be written jointly by a member of the Bureau and the cooperating or contracting individuals in the other organizations or over the signature of some single individual, wno may be an employee either of the Bureau or the other agency—e. g., a State Agricultural College.

A few book reviews will be carried, with especial attention to books which deal with research or statistical methods or to books falling within the more general social science fields where the conclusions or recommendations are chiefly based upon agricultural economics research. In addition, the editors will include in each issue a selected list of the more recent research and statistical releases of the Bureau which seem most significant, together with a series of short notes indicating the nature or content of each item.

Some of the questions that may be raised with respect to this new publication need to be considered.

Questions may be raised with respect to coverage. We have already indicated the type of articles believed to be appropriate, but it is perhaps worth saying that this journal is not designed to compete either with the *Journal of Agricultural Research*, which offers workers in the natural sciences a medium for articles, or the field covered by professional journals such as the *Journal of Farm Economics*. Articles dealing directly with agricultural policy will not be included. Articles in this field originating within the Bureau are expressions of personal opinion rather than official statements and are usually so designated. Such articles as a rule should be offered to some outside professional journal.

Some question may be raised with respect to cost. As best we can estimate, the annual cost of the journal will be about equivalent to the cost of publishing one fair-sized technical bulletin. But the journal should offer a medium of publication for several workers in each issue whereas the technical bulletin as a rule serves as a means of publishing the results of one project. *Agricultural Economics Research* can be so used as to economize printing funds as well as to allow the more prompt publication of technical material.

A question may be raised with respect to the definition of the term, agricultural economics research. The term is here used in its widest sense to cover all work ordinarily carried forward by the Bureau, including work done in cooperation with other agencies such as State Agricultural Colleges and State Departments of Agriculture. That is, we consider agricultural economics to cover specifically the entire field of agricultural estimates or statistics, of rural social studies, and of research on such subjects as prices, marketing, land economics, farm finance, and farm management.

Finally, there is a fourth question that is almost inevitable—the question as to where and how workers in the Bureau will find time to write articles. However, in many instances there is need for at least a progress report well before a study is wholly completed. We believe that there is good reason why a considerable amount of such work should be published in a permanent journal rather than in mimeographed form, especially as mimeographed releases are always difficult to find once immediate interest in the subject has subsided. As a matter of fact, there are several excellent reasons why researchers and statisticians within the Bureau generally should give more rather than less time to bringing their material into some organized written form. After all, *agricultural economics work is carried on in the public interest and every researcher or statistician, regardless of his field, does have a responsibility for seeing that his material is prepared in such a way as to be readily accessible to his fellow workers and to the public.* We hope that this new journal will assist us to this end.

Designs of Samples for Surveys

By Earl E. Houseman

In this discussion the author deals with the most frequent questions that come to him, as statistical consultant in the BAE, relative to designing samples for social science surveys. Although he draws heavily on the recent developments in sampling theory, he presents this material in a non-mathematical language.

WHEN designing a survey, the technical sampler usually tries to achieve the minimum sampling error consistent with a given cost or he tries to obtain a specified sampling error at a minimum cost. This is the principle on which much of the research work on sampling methods has been based. It restricts the choice to samples having a measurable sampling error; this, in practice, generally means choosing some form of random sampling. To apply the principle, costs and sampling errors of alternative methods are needed. But the principle of minimum sampling error per dollar is not entirely satisfactory, for it deals with only one of two major components of error in survey results and furnishes no answer to the question of how much different degrees of accuracy are worth.

Kinds of Errors in Survey Data

For purposes of discussion, it is convenient to classify all errors that can occur in a survey into two major categories: Sampling errors and non-sampling errors. Sampling errors, as visualized here, arise from the fact that a sample is involved instead of a complete census. They are the errors associated with the process of selecting a sample or with determining which sampling units are in the sample. Non-sampling errors arise from failure to get accurate information about each sampling unit in the sample. Reasons may include imperfect memory on the part of those being interviewed, omission by interviewer of some of the specifications of the data which should be included in the questions asked, and deliberate misstatements by those interviewed. Non-sampling errors occur during a census as well as during a survey made by means of a sample. Some writers have mentioned a third source of error—physical fluctuations as found in the case of forecasts. This kind of error is not a genuine survey error, for it may occur even though information on factors included in the survey is obtained without error when the survey is made.

It is common knowledge that non-sampling errors, or response errors, are often large enough to cause serious trouble. Estimation of number of farms is a good example. A small area sample for use in estimating the number of farms in the United States with a sampling error of less than 1 percent can be easily designed, but means have not been found for holding the non-sampling error to a negligible quantity because of the problem of defining a farm and following the definition in the field. Differences in farm counts as large as 10 or 15 percent have been observed between surveys when the sampling standard errors were known to be as low as 2 or 3 percent.

The magnitude of non-sampling errors might increase with an increase in size of sample because of the administrative difficulty of maintaining high standards in the interviewing and keeping adequate control over all phases of the work. In general, the smaller the sample the better one can minimize or control the non-sampling error. Hence, more accurate results might be obtained through sampling than through attempting a complete canvass, particularly when large and complex populations are dealt with.

For illustration, suppose a given sum of money is available for a Statewide survey among farmers. By expending very little effort on the control of response errors, a sample of 4,000 farms could be covered. An alternative might be to spend considerable effort on minimizing response errors, and so cover only 3,000 farms as the sample. Which alternative should be followed? The decision should be based upon knowledge of interviewing and operating conditions, and the sampling error, supplemented by best judgment.

The first might be chosen on the basis of getting more schedules per dollar, but fortunately the notion or assumption that size of sample is the only important factor affecting accuracy is gradually disappearing. Assuming that the samples are equally well designed, the writer would ordinarily recommend the second alternative. The writer usually follows the principle, when resources permit, of designing a sample just large enough so the sampling error is at a satisfactory level; then he emphasizes making every effort to minimize non-sampling error.

More work is needed in the general field of controlling non-sampling errors. The Bureau of the Census has been testing the possibilities of self-enumeration as a means of reducing costs and testing the possibility of getting more accurate information that way, because the respondent is free to fill out the questionnaire when he has time and can consult any records he may have.

Total Error the Crucial Point

Most research in survey methodology during the last 10 years has emphasized methods of reducing sampling errors. Much is known about the statistical efficiencies of alternative sampling schemes. But lack of information on survey costs is a major factor limiting extensive use of the principle of minimum sampling error for a fixed cost. Some progress has been made on the development of methods and principles of controlling non-sampling errors, but nearly all methodological studies have aimed at minimizing sampling errors per dollar rather than minimizing total errors. As work on the control of non-sampling error progresses, consideration should be given to the problem of minimizing total errors—that is, sampling errors plus non-sampling errors—per dollar spent. It might be impossible to develop the principle of minimum total error per dollar in terms of mathematical equations as in the case of minimum sampling error per dollar; nevertheless, it is a sounder practical basis for making operating decisions. Examples could be cited where the optimum sample design is clear under the principle of minimum sampling error per dollar, whereas the design which will lead to a minimum total error is uncertain and probably different.

Before discussing sampling design, an important development in schedule construction is worth noting. Schedules have usually been set up with spaces to be filled in under abbreviated headings, statements, or questions. These cannot be read off by an interviewer, so he must frame his own questions. Some of the headings may not contain all of the specifications required. For example, a heading might be "acres in cropland." The definition of acres in cropland is perhaps put in a large manual, the contents of which the interviewer is expected to know thoroughly, so when he asks a farmer for the number of acres in cropland on the farm, he can add all of the specifications as to what is meant by cropland. This type of schedule is sometimes called a reporting form.

A more recent alternative is to design a questionnaire insofar as feasible, so each question is written out, and can be asked as it stands. This type of schedule is called a questionnaire or interview form in contrast to the reporting form. Construction of an interview form requires more work, and careful pre-testing of the form is necessary to success. The interviewers are instructed to ask the questions as they appear on the schedule, to the extent possible, so uniform questioning will be assured and so all of the desired specifications will be included. It is not difficult for interviewers to ask the questions as stated if the questionnaire is properly made up, because that is easier than framing their own questions.

No extensive comparisons between the two approaches have been made. But when supervisors have accompanied interviewers who are using the reporting forms, they have found much variation among interviewers in the way questions are asked and have found frequent omissions of specifications, such as the time period, to which a question relates.

It might be argued that an interview form is unnecessary when the interviewing is done by a few persons who are thoroughly familiar with the subject matter and the specifications of the data. Some critics seem to feel that almost any form which provides space for answers is adequate. But many professional persons (not professional interviewers) are more prone than non-professionals to "bias" questions or answers unconsciously. With their knowledge of the situation, they may be more inclined to talk than to listen. That is, they may be inclined to guess the answers, and frame the questions accordingly. Or they may suggest answers instead of waiting for

answers. There is no documentary evidence on this point but it may be important to use the interview form and the principles of interviewing related to it when professionals are to do the interviewing as well as when it is to be done by laymen.

Probability Sampling v. Judgment Sampling

No matter how a sample is designed, judgment usually enters in one way or another. In some cases a selection of individuals to form a sample is completely a matter of judgment; in other cases the selection is entirely by chance, and judgment is confined to the choice of restrictions to be imposed in the design of the sample.

Probability Samples

Samples selected in such a way that each element in the population has a known probability, greater than zero in the mathematical sense, of being in the sample, are known as probability samples. This is in contrast to judgment or non-probability samples wherein the sampling units have unknown probabilities of selection.

A main effort in modern sampling has been to make the best choice of restrictions to be employed in a sampling scheme, without losing the feature of known probabilities of selection or randomness. Probability samples have certain advantages, but it cannot be said that they are always preferable to judgment samples. Much depends upon the degree of precision required and the job to be done.

The advantages of probability samples result from the ability to use probability theory in the planning and evaluation of sample designs. This enables the estimation of sampling errors, the optimum allocation of the sampling units over the population, the comparison of the relative efficiencies of alternative sampling designs, and the determination of sample size needed to attain a predetermined magnitude of sampling error.

The performance of non-random sampling designs, on the other hand, can be measured only by means of empirical tests and comparisons with check data.

In practice, complete coverage of all elements selected in a probability sample is usually not attained. A sample may be a probability sample on paper, but it may be impracticable or impossible to get complete data on every unit of observation which should be in this sample survey. To try to get the last few interviews to attain 100 percent response is probably too costly to be worth while, but if a high degree of completeness is not attained the advantages of a probability sample may be lost.

Random samples are likely to be criticized on the grounds that time is lost in areas which seem to yield little or nothing in terms of the survey objectives. This is particularly true for surveys involving sporadically distributed units of observation; the surveyor may think it better to go down the road choosing the particular kind of farms or households wanted in the study.

Judgment Samples

The role of judgment in the design of samples is now receiving considerable attention. We should distinguish clearly between two different uses of judgment in sampling: (1) Use of judgment in determining which elements are to be in the sample and (2) use of judgment in setting up the "restrictions" to be placed upon the sample. (These restrictions do not apply to the selection of the individual elements which are finally chosen for the sample. The use of judgment in the selection of sampling units can range from no judgment through to pure judgment. It is this use of judgment that is thought of when speaking of probability versus judgment samples, or of random versus hand-picked samples.)

Although judgment samples have been frequently used, the literature on sampling methods contains little on numerical evaluation. Evidence can be given, however, on the general performance of judgment samples.

One of the best experiments designed to make comparisons between random and judgment samples was conducted by Cochran and Watson.[1] The measurements were on shoot heights of wheat plants, for use in crop-weather studies. They were taken by 12 observers who made judgment selections. Essential points in the findings were: (1) As expected, the biases differed significantly from one observer to another, (2) the average bias for all 12 observers was positive by about 8 per-

[1] COCHRAN, W. G., and WATSON, D. J. AN EXPERIMENT ON OBSERVER'S BIAS IN THE SELECTION OF SHOOT HEIGHTS. Empire Jour. Expt. Agr. 4:69–76 1936.

cent, (3) the average bias varied from plot to plot, and (4) although the observers had been instructed to make the samples representative of all heights of the wheat plants, the variance within the samples was less than the population variance.

In general, the writer's experience conforms with the following two paragraphs written by Yates [2] in 1935:

"The ideal which is aimed at in sampling is to make the sample as representative as possible, so that measurements or observations on it can be taken as virtually equivalent to similar measurements on the whole population. The fact that this ideal is in the mind of the sampler when taking the sample naturally influences his selection if he has any freedom of choice. Most samplers when selecting a representative sample will deliberately reject abnormal material, or if they feel that the sample should be representative of the abnormal as well as the normal will deliberately balance up the different categories of abnormality.

"Unfortunately the sampler's claims to be able to select 'a representative sample' by personal judgment are largely unfounded, and his selection is in fact subject to all sorts of biases, psychological and physical. To avoid these biases and to provide an estimate of the representativeness of the sample, i. e. of the 'sampling error', more rigorous processes of selection have been devised."

It is reasonable to expect that judgment samples will usually be selective in the direction of what the mind regards as the more important elements or in the direction of the less obscure elements. It is also reasonable to expect in general that the variability would be less within judgment samples than within the whole population; if so, this would mean that distributions based on judgment samples might be seriously distorted. In addition to the Cochran and Watson experiment, evidence supporting the two expectations is found in criticisms of well-designed, self-weighted samples. Many comments on stratified random samples are to the effect that in a certain study the sample contains too many households in low-income areas of a city, or the sample contains too many unimportant agricultural counties. Actually, the sample of the given city may have been stratified by income areas, assuring proportionate representation from each.

Intuitively, for some objectives, it makes sense to sample the more important elements at a higher rate. A methodological investigation might indicate that the efficiency of a sample is increased by varying the sampling rate according to some measure of importance of the sampling units. With the aid of sampling theory the question of how much to vary the sampling rate can be answered. Moreover, from knowledge of the different sampling rates, "unbiased" estimates can be made. On the other hand, judgment samples have unknown degrees of selectivity.

Because it is commonly recognized that judgment samples are likely to be distorted, the data are often not treated by computing simple averages. Certain of the sample data might be checked, for example with Census data, then classified and weighted with the hope of removing any appreciable biases. Such treatment of the data should, in general but not always, improve the results, but it may also give a false sense of reliability.

Judgment samples naturally look good to the person who made the selection, but since a sample cannot be accurately appraised by its looks, judgment samplers are likely to have erroneous impressions of the accuracy of their samples.

Comparative Accuracy of Probability and Judgment Samples

Although it is not possible to calculate sampling errors by formula for judgment samples, a simple experiment can be designed to show for various sample sizes how the error in judgment samples compares with that in random samples. For example, consider a population of 100 stones having various weights or a population comprised of 100 counties. By selecting repeated samples for each of several given sample sizes, a relation can be established between the average error (standard error of the sample averages from the population average) and sample size in the case of both random samples and judgment samples. The relationship for the random samples can be plotted, of course, by means of a formula without actually selecting repeated samples. In the case of judgment samples the "error" conceived of here is the standard error of the means of judgment samples of a given size about the population mean, each judgment sample involving a different individual.

When extremely small samples are to be used (samples of about two or three elements) better samples are likely to be obtained through judg-

[2] YATES, F. SOME EXAMPLES OF BIASED SAMPLING. Ann. Eugenics 6:202–213 1935.

ment selection, but as the size of the sample increases the random sample can be expected to yield more accurate results, on the average. There is little documentary evidence to indicate the sample size at which the random sample becomes superior. This will probably vary considerably from one situation to another and with the skill of the sampler. But there seems to be no doubt about this general comparison of the accuracy of judgment and of random samples.

This general comparison, if accepted, provides a basis for interpreting and answering certain criticisms of random samples. Let us consider, for example, a stratified random sample of 200 counties of the United States. (An unrestricted random sample could be used equally well as an example.) Assume 200 strata based upon type of farming, or some such criterion, with one sample county selected from each stratum. County X, a random selection from stratum A, might be questioned on the grounds that it is unlike any other county in the stratum, or that it is of very little agricultural importance. In other words, the critic regards stratum A as a universe in itself, the problem being to select one county to represent that universe. He does not think of the sample as a whole in terms of how well it represents the United States, or perhaps a region, but in effect, incorrectly regards it as 200 individual samples of size 1.

If the purpose is to select one county from stratum A that will give the most accurate representation of that stratum, a hand-picked selection would probably be more satisfactory than a random selection; but no matter what county is selected, it is not an adequate sample of the stratum in any technical statistical sense. A sample should be looked upon as an aggregate. But the question might be asked, "If one hand-picked sample county from each stratum will give the 'best selection' for the strata individually, even though a sample county may not adequately represent a stratum, why does not such a procedure give better results in the aggregate than a random-sampling procedure does?"

The question will be answered with the aid of a hypothetical example. Consider a population of 10 strata with one county to be selected from each. The deviations of sample counties from stratum averages for random and judgment samples might be shown in the tabulation.

	Random selection	*Judgment selection*
	+12	+5
	−10	+8
	+ 5	+6
	−20	+4
	−10	+5
	+15	+3
	+10	+7
	− 4	+6
	− 5	+5
	− 7	+5
Average error	− 1.4	+5.4

Stratum by stratum, in this hypothetical example, the judgment selection is usually better; but as with most judgment selections there is a tendency to be too high (or too low), so in the aggregate the average error for the random sample is smaller, unless the samples are exceedingly small. The previous statement is, of course, made with respect to what happens in repeated samplings.

Decisions To Be Made When Designing Samples

Five broad questions that need to be considered when samples are designed are discussed briefly.

1. *Defining the universe and units of observation*

A necessary step in selecting a probability sample is carefully defining the universe. This usually involves (1) establishing its geographic limits and (2) defining the elements that qualify for the study within the area to be covered. A probability sample cannot be selected without a complete listing, or its equivalent, of all sampling units. On the other hand, when judgment samples are used, the universe and the data to be collected are often loosely defined; in fact, a universe may not be defined at all.

Defining the universe may not present problems. All students registered at some college would represent an easily defined universe. But suppose a special survey of cattle feeders is required. Deciding upon the geographical limits of the area to be surveyed and the definition of a cattle feeder may involve difficult and arbitrary decisions. More serious consideration probably should be given to this question when the survey is to estimate the total number of cattle on feed than when the survey does not involve estimating totals, as in a study of production practices.

It is to be remembered that a sample of 1,000

cases might represent the whole of two States about as well as one State. A sample of 1,000 farmers in Iowa and Illinois, for instance, would represent the two States combined with respect to corn production practically as well as a sample of 1,000 farms in Iowa would represent corn production in Iowa, because corn is found on most farms in both States. As this point is not always understood, a survey is sometimes unnecessarily confined to a small area, because of the misbelief that the accuracy of a sample is more closely related to its size in terms of percentage than in terms of absolute numbers. With respect to a general-purpose farm survey, involving many crop and livestock items, a sample of a given number of farms ordinarily would not represent two States as well as one because of the way various items are distributed geographically. It is difficult to give general rules.

For a poultry survey, the specifications may require that a producer, in order to qualify for the survey, must be larger than some arbitrary size. How large should a producer be to qualify? If field contacts are required to ascertain eligibility for the survey, and if it takes only a few minutes to get a schedule from a small producer, it seems feasible to use a very low cut-off point, or no cut-off point at all. Under such circumstances little time would be saved by excluding small producers, and information would be lost on the small fraction of the total which they represent.

The unit of observation is the unit on which separate schedules or data are obtained. In defining a unit of observation two important considerations are utility or meaningfulness as a unit of analysis, and clarity of the definition from the standpoint of field operations. Closely associated with the matter of defining the unit of observation is definition of data to be collected.

2. *Size of sample*

Size of sample is most commonly determined by the funds available. The problem is to make the most efficient use of resources. Sample size will be discussed here, however, under the assumption that funds do not limit the survey seriously.

A major determinant of sample size is the degree of break-down wanted in the analysis. Are State summaries adequate? Are tabulations by subareas of a State required? Are tabulations by income groups within subareas needed? An increase in the number of groups for which separate tabulations are wanted requires roughly a proportionate increase in the size of sample. It is advisable to work out skeleton tables or an outline of the analysis in advance of a survey, but this is seldom done. The skeleton tables are useful when developing the questionnaire as well as the sampling design. It helps to avoid the omission of important questions or the inclusion of unimportant questions. It gives the sampler a good picture of what is required of a sampling design to meet the survey objectives and provides a better opportunity for the sampler and the subject-matter specialist to reach a clear understanding on what alternative designs can accomplish satisfactorily.

Another major determinant of sample size is the degree of accuracy required. It cannot be said categorically that a sample estimate with a 6-percent coefficient of variation is no good; that a coefficient of variation of 5 percent is required to bring useful results. When measuring change from one point in time to another, however, if the changes are known to be small (2 or 3 percent) it is clear that a precision job is required, and a sampling design with a 5-percent coefficient of variation is inadequate. Specifying a standard of accuracy for a survey calls for an evaluation of how much various degrees of accuracy are worth.

Other factors affecting the size of sample needed are the variability from one sampling unit to another of the information to be collected, the frequency of occurrence of the items, and the efficiency of the sample design. A larger sample of farms is required when making an estimate of the number of hired workers with a given coefficient of variation than when estimating the number of family workers with the same coefficient of variation.

Many persons still think of size of sample in terms of percentage. Questions commonly asked are, "Do you think a 5-percent sample is large enough; or what percentage of the population should be included in the sample?" Actually, it is the number of cases that is important, not whether the sample covers 1 percent or 5 percent of the total. But the proportion that the sample is of the total population does have an appreciable effect on accuracy when sizable proportions are involved—more than roughly 10 percent.

3. *Restrictions to be employed in the sampling design*

There are numerous ways of imposing restrictions in a sample design. It is possible to indicate here the nature of only a few of the decisions that may be necessary. No mention will be made of the principle of stratification or the choice of criteria to be used in stratification as the purpose of stratification is well known.

First, should the sample be a single-stage or a double-stage sample? In a single-stage sample there is only one stage of selection; that is, there is no subsampling of sampling units. A simple stratified random sample of small areas of land (sampling units) in a State when the small areas are completely enumerated is a single-stage sample. A common example of double-stage sampling is making a selection of a sample of counties (primary sampling units) which is followed by selecting small areas (secondary sampling units) within the selected counties. Such a double-stage sampling scheme reduces the scatter of a sample and its cost compared with a single-stage sample. But the reduction in scatter means a reduction in the efficiency or accuracy of the sample. With knowledge of appropriate components of cost and of the magnitudes of components of sampling error, the sampler can determine the allocation of the sample which will give the lowest sampling error per dollar; that is, he can decide how many primary sampling units should be selected relative to the amount of sampling within the primary sampling units.

In the case of single-stage sampling, the size of the sampling units, and in the case of double-stage sampling, the sizes of the primary and secondary sampling units, must be determined. The objective of maximum accuracy per dollar is used in making the decision. As an illustration, a single-stage sample of 1,000 farms, in 100 clusters of 10, is less efficient and costs less to use than a sample of 1,000 farms in 200 clusters of 5. By and large, with respect to agricultural items, methodological research indicates that it pays to do what may seem excessive traveling.

In general, the more that is known about the population to be sampled, the more efficient the sample that can be designed. This is somewhat ironical for if enough were known about the population a sample would not be necessary.

4. *The non-response problem*

What instructions should be given regarding the number of calls to make when no one is at home? Making one call at every farm or household in the sample usually yields interviews with roughly 70 percent of the specified farms or households. Here are three ways of dealing with the remaining 30 percent. (1) Make no effort to get information on the remaining 30 percent. (2) Take a subsample of the remaining 30 percent and make every effort to get an interview with everyone in the subsample. Some theory [3] has been worked out for indicating the optimum degree of subsampling of non-respondents. The same theory applies in the case of a mailed questionnaire when one wishes to take a follow-up sample of non-respondents by personal interview. This scheme requires weighting the data to get unbiased estimates. (3) Use three calls, or enough to get at least a 90-percent coverage. The survey specifications should be set up in such a way that the degree of completeness is known.

A decision on the question of call-backs is again a matter of accuracy and cost. Experience has shown that individuals who are found at home on the first call often differ so much from those who can be found only after two or more calls that the non-response problem cannot be ignored. However, the feasibility of making call-backs is sometimes seriously questioned because of the expense.

Let us examine the costs in terms of schedules per dollar. For purposes of discussion, assume area sampling to get an expected number of farms equal to 100. (The word "calls" as used below means the total number of calls including first call and call-backs.)

Scheme A: If no call-backs or substitutions are made and there are no refusals, a sample of 143 farms must be specified to get 100 schedules, assuming one call to each yields schedules from 70 percent of the farms. Thus 143 calls are required to get 100 schedules.

Scheme B: On the other hand, suppose a sample of 100 farms is specified and an indefinite number of call-backs is required so that close to 100 sched-

[3] HANSEN, MORRIS H., and HURWITZ, WILLIAM N. THE PROBLEM OF NON-RESPONSE IN SAMPLE SURVEYS. Amer. Statis. Assoc. Jour. 41 (236): 517–529 1946.

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ules are obtained. If the proportion of schedules obtained on successive calls remains about 70 percent, 143 calls will yield very close to 100 schedules, if there are no refusals. The average number of calls per schedule (1.43 in the above illustration) is approximately the same, regardless of whether call-backs are specified or not, if the proportion of interviews obtained in each successive call remains about constant. A sample of 100 schedules under Scheme B is worth more than a sample of 100 schedules under Scheme A. An alternative would be to select a sample of 100 farms and make substitutions for those who are not at home on first call, but making substitution does not appear to be a satisfactory solution to the non-response problem.

Actually, it is conceivable that in some situations a sample with specifications for call-backs might have lower costs of collection per schedule than a scheme where no call-backs are made. Much depends upon how the field work is organized and the method of sampling involved. As area sampling has been applied when sampling farms, an appreciable amount of time is required to identify the farms in a segment and establish their headquarters, before determining which farms should be included in the sample. Under Scheme A, about 40 percent more segments are required than under Scheme B to yield the same number of schedules. The cost of selecting 40 percent more segments and identifying the farms in them is a factor leading to higher costs under Scheme A.

The objective here is not to discuss all of the factors making one scheme more or less costly than the other, but to indicate that making call-backs may be less expensive than supposed on first thought.

5. *Expansion of the sample*

Methods of expansion or estimation should be considered during the planning stages of a survey. Sampling specifications may be affected by them; for example, if a highly efficient method of expansion is available, perhaps a smaller sample can be used. Or the field instructions may be affected, or the control or identification information on the questionnaire. Specifications of a sampling design are not complete until consideration has been given to the question of expansion.

When deciding upon a method of estimation, statistical efficiency is only one of the factors involved. In many surveys there are deficiencies which may affect some methods of estimation more than others. An example is the use of an area sample for the purpose of getting a sample of farms according to the Census definition. Appreciable incompleteness might occur among small borderline farms.

Three methods of estimation may be considered: (1) Reciprocal of the sampling rate, (2) mean per farm, and (3) ratio to farmland. For the second and third the expansion factors are assumed to be Census number of farms and farmland, respectively. The first method would be satisfactory for items that are found in very small quantities or nonexistent on the small borderline farms, as hired labor. Estimates of total hired workers would be unaffected by omission of farms having no hired workers; but this would not be true with the mean-per-farm method of estimation. On the other hand, by the first method estimates of total farm population could be seriously affected by the omission of some of the small farms; the effect on estimates made by the second method would be less serious. For many crop acreages an estimate made by the mean-per-farm method would be affected more than the estimates made by either of the other two methods.

Parity Prices

By C. Kyle Randall

The Bureau of Agricultural Economics has been calculating the official parity prices since the date of their official initiation. In the interest of presenting the necessary revisions in the level of parity prices as well as the methods of calculation occasioned by the Agricultural Act of 1948, the author has written this article.

PARITY prices have been an integral part of agricultural policy of the United States since 1933. Action programs that have had a material effect on the economic situation of agriculture have been based on or related to parity prices. These programs include such things as price supports, price ceilings, and marketing agreements and orders. Parity prices in themselves are merely measuring devices or yardsticks; it is only when action programs based on parity prices are in operation that prices received by farmers are appreciably affected by them.

One of the significant provisions of the Agricultural Act of 1948 [1] is the revision in the parity-price formula which is effective January 1, 1950. This is the first major change in the parity-price formula since it was included in the Agricultural Adjustment Act of 1933. The present formula implies that the purchasing power of a unit of *each individual farm product* should be maintained at its level in some fixed (and often distant) base period. The new formula implies that the purchasing power per unit of *agricultural products in general* should be maintained at the 1910–14 level, but that relative prices of individual farm products should be based upon recent experience and should change gradually with changing conditions of supply and demand.

Review of Present Practice

A review of the present parity-price formula makes perhaps the best point of departure for discussing the new one.[2] The present formula is designed to result in prices for individual agricultural products which would have the same purchasing power in terms of prices paid by farmers as they had in some base period. There are a number of these base periods. For many of the important farm commodities the base period is the 60-month period August 1909–July 1914.

From time to time different base periods have been specified for other commodities. At present, the base period for potatoes and all types of tobacco,[3] except flue-cured (types 11–14) and Burley (type 31), is the period August 1919–July 1929. The base period for flue-cured and Burley tobaccos is August 1934–July 1939. The Agricultural Marketing Agreement Act of 1937 provides for the use of the period August 1919–July 1929 or some part thereof for any commodity for which satisfactory data for the determination of purchasing power are not available for the period August 1909–July 1914.

As of July 1948 the Bureau of Agricultural Economics was calculating parity prices for 149 agricultural commodities. Of these, only 47 commodities remained on the August 1909–July 1914 base, including three commodities for which comparable prices are used. One hundred commodities utilized the period August 1919–July 1929 or some part thereof and two classes of tobacco were on the August 1934–July 1939 base.[4] For a few commodities price data are available for only two or three seasons in the 1919–29 period. The commodities remaining on the 1909–14 base accounted for about 85 percent of total cash receipts from farm marketings in 1947.

[1] U. S. Stat. 62: 1247, 1948.

[2] Throughout this discussion the parity-price formula now in use, which is based on the legal provision of the Agricultural Adjustment Act of 1938 as amended and the Agricultural Marketing Agreement Act of 1937, is referred to as the present parity formula. The formula based on the Agricultural Act of 1948 is called the new formula.

[3] A provision of Title I of the act provides for the use of August 1936–July 1941 as the base period for Maryland tobacco, effective January 1, 1949. This special base period for Maryland tobacco is, of course, eliminated by the new parity formula, effective January 1, 1950.

[4] See U. S. Bur. Agr. Econ., *Agricultural Prices*, July 1948, pp. 26–31 for base periods for the list of commodities.

For commodities on the August 1909–July 1914 base period, purchasing power is measured by the index of prices paid by farmers, *including* interest and taxes. For commodities on other base periods, the index of prices paid, *excluding* interest and taxes, is used. This index of prices paid is based on prices collected by Bureau of Agricultural Economics for 86 items used in family living and 91 items used in farm production.[5]

The index of prices paid is converted to whatever base period is used for the parity price of a given commodity. This has necessitated the use of several conversion factors.

Parity prices are based on and are comparable to national average prices received by farmers for commodities sold in their local markets. Parity prices are not computed by States, by grades, or for specific markets. In administering action programs, however, it is possible to determine differentials for grade, location, season, or other factors, to be applied to parity prices. The resulting prices should properly be described as parity equivalents rather than parity prices.

For many of the major commodities on the August 1909–July 1914 base period, the base-period price is a simple 60-month average of prices received by farmers. As an illustration, the price received by farmers for wheat during the base period was 88.4 cents per bushel. The parity index (1910–14=100) as of September 15, 1948 was 250. Therefore, the parity price of wheat was 2½ times 88.4 or $2.21 per bushel.[6]

For most of the commodities that are on the other base periods, the base-period price is an average of weighted season average prices. For example, the base-period price of potatoes (1919–28 seasons) was $1.12 per bushel. The index of prices paid (excluding interest and taxes, August 1919–July 1929=100) as of September 15, 1948 was 166. Therefore, the parity price of potatoes was $1.86.

This definition of parity prices determines a fixed set of relationships among the parity prices of the various agricultural commodities as well as an over-all relationship between prices received by farmers and prices paid by farmers. One of the criticisms of the present parity-price formula has been that the formula freezes the relationships among agricultural prices that existed as much as 35 years ago and does not take account of the changes in price relationships which could be expected to result from changing technology and demand conditions.

Revision of Formula

The Agricultural Act of 1948 so revises the parity-price formula, effective 1950, that the price relationships among the commodities are based on the last 10-year period preceding the year for which parity prices are being calculated. The over-all relationship between prices received by farmers and prices paid by farmers is still determined from the 1910–14 period.

The new formula substitutes an "adjusted base price" for the actual base-period price in the parity-price calculation. This adjusted base price is the average price received by farmers for the commodity during the last 10 calendar years (or marketing seasons) preceding the determination, divided by the general index of prices received by farmers during that same 10-year period. Again using wheat as an example, the 1938–47 average price received by farmers for wheat was $1.22 per bushel. The index of prices received by farmers in that period was 168. The adjusted base price for wheat, then, is 72.6 cents per bushel. This base price multiplied by 2½ gives a new parity price of $1.82.[7]

Parity prices calculated according to the new formula[8] and the present formula as of October 15, 1948, for several important agricultural products are given in table 1. In general, the new formula results in lower parity prices for the major field crops and higher parity prices for many of the livestock items.

[5] For a description of this index see U. S. Bur. Agr. Econ., *Agricultural Prices*, Oct. 1948, pp. 25–32.

[6] See U. S. Bur. Agr. Econ., *Agricultural Prices*, July 1948, pp. 26–31 for base periods and parity prices for the complete list of commodities.

[7] These parity prices are based on the 10-year period 1938–47 and are illustrations only. When the new parity formula becomes effective in 1950 the parity prices will be based on average prices received by farmers for individual commodities and the average of the general index of prices received by farmers in the period Jan. 1940–Dec. 1949.

[8] See footnote 7.

Transition Period

The law provides for the use of transitional parity prices for those commodities for which, at the time the new parity formula becomes effective, the new parity prices are less than 95 percent of the parity prices calculated according to the present formula. The transitional parity price is 95 percent of the parity price according to the present formula the first year; 90 percent the second year; 85 percent the third year; and so on until the transitional parity price is lower than the parity price according to the new formula. Based on the relationships existing in the 1937–48 period, it would require 4 years to make the transition for wheat and 3 years for cotton and corn. It is of course possible that these price relationships will change within the next few years so that the transition period for these crops may be either shorter or longer than the present relationships would indicate. Column 4 in table 1 illustrates the transitional parity prices for several commodities, assuming that the parity price provisions of the Act went into effect January 1, 1948.

Practices Under New Formula

Once the transition to new parity prices has been made, the general level of parity prices will be substantially the same as the general level of parity prices according to the present formula. Also by that time all parity prices will be calculated from the same base period and the use of a number of different base periods, which now complicates the parity calculation, will be eliminated.

The use of the latest 10-year period, moving forward a year at a time, is designed to keep the relative parity prices in a more nearly satisfactory alignment with current conditions of supply and demand. It will also make it possible to calculate parity prices for new commodities which have become increasingly important since the base periods specified by law.

It should be remembered that the parity index establishes the level of parity prices. If the parity index stands at 250, for instance, the new formula indicates that the index of prices received with prices at parity should also be 250. The parity price of a particular commodity depends in part on the average price received for that commodity during the latest 10-year period relative to the index of prices received during that same period. A high price for a commodity during the latest 10-year period will not necessarily result in a higher parity price, provided the index of prices received was also high during that 10-year period.

The change in price of a given commodity from the present parity base period to the 10-year period, in contrast to the change in the index of prices received by farmers over the same period of years, determines whether the new parity formula results in a higher or lower parity price than the present formula. Using the 1937–48 period again as an illustration, the index of prices received during that period averaged 168. Any commodity whose price during that period was less than 168 percent of its price in the parity base period (August 1909–July 1914) would have a lower parity price under the new formula. Any commodity whose price in the 10-year period averaged more than 168 percent of its price in the parity base period would have a higher parity price under the new formula.

How It Works Out

The increase in prices of wheat (38 percent) and cotton (46 percent) is less than the increase in the index of prices received (68 percent). Therefore the parity prices according to the new formula are less than those calculated by the present formula. The increase in prices of hogs (72 percent) is slightly greater whereas that for beef cattle (101 percent) is substantially larger than the increase in the index. As a result, new parity prices for these products are higher than the present parities.

The fact that the new formula utilizes the latest 10-year period makes the adjustment to relatively recent conditions automatic. This is designed to eliminate efforts to select special base periods for certain commodities. In addition, the task of obtaining satisfactory price information for the latest 10-year period is much simpler than obtaining price information for the August 1909–July 1914 period, or the August 1919–July 1929 period, for many commodities.

Publication of Parity Prices

The use of this new parity-price formula will require some changes in procedures in the Bureau of Agricultural Economics in regard to publication

of parity prices. For several years the Bureau has published parity prices of a number of important agricultural commodities each month in its *Agricultural Prices* and has published a complete list of parity prices for all agricultural commodities for which such prices are calculated twice each year, in that publication. When the new formula becomes effective it will probably be necessary to recalculate the "adjusted base prices" shortly after the first of each year. This will require the use of preliminary estimates of season average prices received for the last season in the 10-year average. The law provides that the marketing seasons beginning in the previous 10-calendar-year period shall be used in determining the adjusted base prices for those commodities whose parity prices are based on weighted season averages.

For the commodities whose marketing seasons start late in the calendar year it may be necessary to recalculate the adjusted base prices during the year, as revised season average prices for the preceding season become available. But this can be done, at least in most cases, before any action program, such as a support-price program based on the parity price for a specific commodity, would be undertaken.

Redefinition of Parity Income

Parity income has not been used as a basis for any agricultural program. The latest statistical data on parity income can be found in the *Farm Income Situation* for August–September 1948. Those interested in a thoroughgoing discussion of parity income as now defined should see *The Concept of Income Parity for Agriculture* by Ernest W. Grove.[9]

[9] GROVE, E. W. THE CONCEPT OF INCOME PARITY FOR AGRICULTURE. In Conference on Research in Income and Wealth. Studies in Income and Wealth. V. 6, pp. 96–140. Natl. Bur. Econ. Research. New York. 1943.

Parity income is redefined in the Agricultural Act of 1948. Parity income as now defined in the Agricultural Adjustment Act of 1938 is the per capita net income to persons on farms from farming that bears the same relationship to per capita income of persons not on farms as prevailed in 1910–14. This definition was more or less tailored to fit the available statistics. It will be noted that the nonfarm income of farm people is allocated by this definition to the nonfarm population. It seems fair to say that practically no one has been completely satisfied with this definition.

The definition of parity income in the Agricultural Act of 1948 is as follows:

" 'Parity' as applied to income shall be the gross income from agriculture which will provide the farm operator and his family with a standard of living equivalent to those afforded persons dependent upon other gainful occupation."

This definition appears to be the statement of a laudable objective but in the present state of the arts, is not subject to statistical determination.

It might be well to quote the statement of the former Secretary of Agriculture on this point.

"S. 2318 also includes a new definition of parity income. However, this definition is not related to any operating provisions of the bill. Apparently for the present this definition merely states the principle that parity income rather than parity prices should be the ultimate objective of agricultural policy. It is not now possible to put the proposed definition of parity income into statistical form and if this definition remains, it will be taken as a directive to institute research looking toward a quantitative definition of income parity within the limits of funds and personnel which may be made available." [10]

[10] UNITED STATES CONGRESS, SENATE, COMMITTEE ON AGRICULTURE AND FORESTRY. AGRICULTURAL ACT OF 1948. HEARINGS . . . ON S. 2318 . . . 80th Cong., 2d sess., 1948. p. 56.

TABLE 1.—*Prices received by farmers, parity prices, and parity prices according to provisions of Agricultural Act of 1948, (assuming the act went into effect Jan. 1, 1948) United States, Oct. 15, 1948*

Commodity	Unit	(1) Average price received by farmers Oct. 15	Parity price Oct. 15		
			(2) Agricultural Act of 1948 formula	(3) Transitional [1]	(4) Present formula
		Dollars	*Dollars*	*Dollars*	*Dollars*
Field crops:					
Wheat	bu	1. 98	1. 81	2. 09	2. 20
Corn	bu	1. 38	1. 41	1. 52	1. 60
Oats	bu	. 699	. 814	. 944	. 994
Barley	bu	1. 10	1. 20	1. 46	1. 54
Rice	bu	2. 07	2. 13	----------	2. 02
Rye	bu	1. 43	1. 44	1. 70	1. 79
Grain sorghums	cwt	1. 99	2. 32	2. 86	3. 01
Flaxseed	bu	5. 74	4. 11	----------	4. 21
Dry field peas	cwt	4. 84	5. 55	----------	5. 20
Beans, dry edible	cwt	7. 99	8. 24	----------	8. 39
Soybeans	bu	2. 27	2. 46	----------	2. 39
Peanuts	lb	. 104	. 092	. 114	. 120
Cotton	lb	. 3107	. 2679	. 2934	. 3088
Cottonseed	ton	63. 70	65. 98	----------	56. 10
Potatoes	bu	1. 42	1. 60	1. 75	1. 84
Sweetpotatoes	bu	2. 07	2. 28	----------	2. 19
Fruits:					
Apples	bu	2. 20	2. 69	----------	2. 39
Grapefruit	box	. 61	1. 12	1. 95	2. 05
Lemons	box	2. 38	2. 31	3. 14	3. 31
Oranges	box	1. 60	2. 30	3. 57	3. 76
Livestock and products:					
Hogs	cwt	24. 60	18. 53	----------	18. 10
Beef cattle	cwt	22. 10	16. 16	----------	13. 50
Veal calves	cwt	25. 00	18. 23	----------	16. 80
Sheep	cwt	9. 08	8. 47	10. 74	11. 30
Lambs	cwt	22. 10	17. 63	----------	14. 60
Butterfat	lb	. 678	[2]. 657	----------	[2]. 655
Milk, wholesale	cwt	4. 93	[2] 4. 16	----------	[2] 3. 98
Chickens	lb	. 299	. 301	----------	. 284
Turkeys	lb	. 427	. 364	----------	. 359
Eggs	doz	. 547	[2]. 463	[2]. 508	[2]. 535
Wool	lb	. 461	. 518	----------	. 456

[1] Assuming the act went into effect Jan. 1, 1948, transitional parity prices would be 95 percent of the present parity in those cases where that is higher than parity prices according to new formula.

[2] Not adjusted for seasonal variation.

Interviewing Non-respondents to a Mail Survey: An Experiment in Connection With April 1948 Farm Stocks Report[1]

By J. C. Scholl and C. E. Burkhead

One of the most important aspects of the statistical-improvement work in the BAE is the measurement and the elimination, if possible, of any biases in the official estimates resulting from the use of mail surveys. This article reports on one of the attempts to deal with this problem.

ESTIMATES prepared by the Crop Reporting Board are recognized as generally reliable, especially where collateral check data are available. Such check data vary among the crops, but quantitative acreage and production bench marks for most crops are provided by the Federal Census of Agriculture every 5 years. One important series of estimates, stocks of grains on farms at specified dates, has not been supported by such collateral check data. Owing to the vital need for some objective test for ascertaining the reliability of estimates of stocks for the principal grain crops, a special survey, involving the interviewing of non-respondents, was conducted during April 1948.

The general schedule now provides the principal basis for preparing estimates of stocks on farms. Data collected in this way may contain some bias because of selectivity both in the list and in the response. A special study seemed appropriate in order to obtain information regarding the extent of bias, if any, resulting from each of these potential sources of selectivity.

It is felt that we have made a start toward checking some of our estimates, where bench marks are generally lacking, in an objective way and that we have established the feasibility of enumerating non-respondents for research purposes, but not necessarily for current estimates. The conclusions drawn in this report are based on a small number of non-respondents, perhaps too few, but the study does establish the fact that the groundwork has been laid for making future surveys of this nature.

Plan

The problem was to measure the bias, if any, in the ratio of farm stocks to production as obtained by mail questionnaire. The procedure followed was to use a special schedule, containing questions regarding grain stocks comparable with those on the April 1948 general schedule, in each of the 25 States participating in the project (table 1). Ten of these States have an annual State assessors' census, from which names were systematically drawn for use in connection with the special schedule. In the remaining States other lists, which State statisticians had for other purposes, were used. The special schedules were mailed from field offices on approximately the same date as the general schedules. The information from the special schedules was transmitted to Washington with information collected from the general schedule. They were given little consideration when the April 1 official estimates were prepared because an analysis of the results could not be completed before the estimates were made. It did not appear desirable to disrupt the comparability with previous years until the results could be examined more carefully.

It was believed that a special survey of this kind would provide a check upon the present level of estimates of grain stocks as of April 1.

[1] The interviewing of the non-respondents entailed considerable effort on the part of the State Statisticians and their staffs; the authors wish to express their thanks for this help. Interviewing in Indiana was done by M. M. Justin, T. J. Kuzelka, and R. E. Straszheim; in Kansas by Rex G. Butler, W. G. Hill, R. R. Schlicht, and two hired enumerators; in North Carolina by Henry G. Brown, C. E. Burkhead, Ray B. Converse, W. C. Hinson, Jr., J. C. Scholl, O. Wakefield, and C. Z. Willis; and in Washington by H. N. Hadley, A. R. Larsen, H. C. R. Stewart, and J. C. Thompson.

A limited number of non-respondents were selected and interviewed in each of four States, Indiana, Kansas, North Carolina, and Washington. In addition, questions regarding six grain crops were asked in an interview survey of a cross-section sample of about 800 farms in Kansas, beginning about March 15. These various phases are discussed in more detail later in this report.

Results

Table 1 shows the percentage the April 1, 1948, grain stocks on farms were of the 1947 production as indicated by the special survey, together with the indications from the general schedule, for the grain crops in each State where the special survey was made. The first 10 States in the table are those in which the special schedules were sent to an assessors' list. Averages for this group of States, weighted by 1947 production, are also shown, the general-schedule averages being higher in all cases than the special-survey indications. Table 1 also includes similar data for the remaining States, those in which the special schedule was sent to some list other than the assessors'. It appears that the general-schedule averages for this latter group of States also have an upward bias, compared with the special schedule. However, the difference between the special- and general-schedule averages were generally smaller for the group of States using "other lists" than for those using the assessors' list.

TABLE 1.—*Reported grain stocks on farms as of Apr. 1, 1948, expressed as a percentage of 1947 production* [1]

State	Corn		Wheat		Oats		Barley		Rye		Soybeans		Flaxseed	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Illinois	41.3	37.4	6.3	5.0	30.6	30.4	18.0	9.7	9.5	3.9	16.1	13.5	------	------
Indiana	41.2	39.0	8.7	6.4	33.0	30.5	28.4	[2] 8.9	16.0	5.9	15.7	14.0	------	------
Iowa	44.4	43.0	13.4	13.9	36.7	35.5	59.5	58.5	26.9	10.2	21.3	18.8	24.1	12.5
Kansas	35.2	30.2	22.4	17.3	32.5	28.5	33.6	22.3	11.3	17.3	18.8	17.5	5.2	5.8
Minnesota	36.4	36.2	30.2	28.5	36.3	33.7	22.4	19.8	7.3	12.1	17.7	15.1	21.8	16.2
Missouri	36.6	38.3	9.4	10.7	41.0	34.1	26.3	20.3	7.1	21.4	18.5	22.9	------	------
Nebraska	39.4	36.4	18.2	16.5	34.0	29.9	29.5	29.9	22.9	14.6	17.6	42.6	------	------
North Carolina	49.5	48.1	20.0	20.1	18.5	20.5	22.1	25.6	13.3	34.8	21.3	40.3	------	------
South Dakota	38.3	37.3	37.8	34.9	41.0	33.7	36.1	32.2	22.4	17.6	24.9	14.7	21.0	21.6
Wisconsin	34.8	32.7	42.7	44.9	37.8	33.7	20.1	19.0	26.5	30.0	32.1	25.0	31.5	46.8
Average 10 States	40.5	38.5	21.2	17.8	35.8	32.8	29.4	26.1	17.9	15.9	17.5	16.2	------	------
	a	c	a	c	a	c	a	c	a	c	a	c	a	c
Arkansas	36.5	27.8	23.3	18.1	12.9	12.4	16.3	------	------	------	8.0	7.2	------	------
Delaware	35.2	34.3	9.1	13.7	11.6	10.8	15.2	19.6	7.8	0.1	28.9	26.8	------	------
Idaho	66.4	19.7	10.2	14.2	29.3	27.0	25.0	21.7	17.1	10.8	------	------	------	------
Kentucky	39.4	36.7	5.1	6.4	27.7	19.7	14.4	10.0	6.8	3.7	24.1	18.8	------	------
Maryland	32.5	34.9	8.3	8.2	30.4	25.4	18.0	17.3	9.5	8.6	26.1	22.2	------	------
Michigan	38.9	40.4	21.1	19.9	41.1	36.7	37.2	33.1	19.7	21.2	41.8	17.1	------	------
Montana	35.8	33.4	26.8	22.6	46.8	46.1	30.5	29.4	22.8	52.8	------	------	[2] 12.6	[2] 38.6
New York	37.2	35.1	21.2	19.3	41.0	34.0	41.5	39.8	16.4	.2	42.0	77.5	------	------
North Dakota	26.2	29.7	38.7	35.9	48.9	44.4	36.9	36.3	15.5	12.8	72.3	13.5	29.6	28.2
Oklahoma	24.5	23.0	9.7	8.1	21.9	21.7	25.5	32.2	7.6	5.6	[2] 18.1	[2] 35.4	------	[2] 2.9
Oregon	30.5	29.6	8.5	7.7	30.1	28.6	12.7	16.3	26.8	[2] 31.3	------	------	------	[2] 5.8
Pennsylvania	44.6	44.4	21.0	21.2	35.5	40.7	26.3	19.4	29.4	32.5	21.9	49.8	------	------
Tennessee	39.3	40.5	9.4	9.9	13.4	16.2	11.6	12.1	9.4	4.8	11.0	12.2	------	------
Texas	19.7	21.6	10.3	8.9	12.1	14.8	18.8	15.5	13.1	[2] 30.4	------	------	------	[2] 4.1
Virginia	44.1	42.8	13.6	17.2	20.9	22.4	22.6	21.0	18.8	18.6	29.0	17.2	------	------
Average 15 States	36.3	35.7	20.1	18.5	33.6	32.0	29.9	29.0	16.2	16.6	21.4	16.1	------	------
Average all 25 States	39.6	37.9	20.6	18.2	35.3	32.6	29.7	27.7	17.2	16.2	17.7	16.1	------	------

a. April 1948 General Schedule.
b. Assessors' list.
c. "Other" lists used.

[1] Refers to mail surveys only.
[2] Straight average.

As the production of grains in the 25 States participating in the project represents most of the total of United States production in 1947, the averages obtained from the special schedule in these 25 States are assumed to approximate closely the national averages that would have been obtained had the survey been conducted in all 48 States. The special-schedule averages, which are shown at the bottom of table 1 for the 25 States combined, were lower for all commodities than were the averages from the general schedule.

In addition to the data for stocks provided by this survey, collateral data for stocks of wheat, corn, oats, sorghum grains, barley, and rye were obtained from questions included in the 800-farm interview survey conducted in Kansas during March 1948. Summaries have been prepared *only for wheat, corn,* and oats. The results of this interview survey are not entirely comparable with those obtained from either the special or the general schedules because a farmer was visited *before* April 1 and was asked to estimate the stocks he would have on his farm on April 1. In this particular survey in Kansas, stocks as a percentage of production were lower, for the three crops for which summaries have been prepared, than those reported on the general schedule.

Results of this study cannot be considered conclusive in establishing a quantitative measure of bias in the returns from the general schedule because of the small sample used in some States, the fact that the study covers only one quarterly period and other reasons. It appears that a bias exists in both reported stocks and in production but is more pronounced in regard to the stocks. Here it seems appropriate to point out the results of the January 1948 mail survey, in which the 15,000 farmers who had been interviewed during the January 1947 Enumerative Survey were sent a questionnaire that included questions on grain stocks on farms. About 7,400 of these questionnaires were returned. The stocks reported on hand as of January 1, 1948, as a percentage of 1947 production are in close agreement with those adopted by the Crop Reporting Board at the national level. Table 2 shows the results of this mailed questionnaire survey.

Based on what information we now have, it is possible that the bias in farm-stocks data obtained by mail is of a seasonal nature, being less for periods when farm stocks are highest and probably greater as we get further away from the harvest season. We have no conclusive proof that this is true but we have the results from this particular study and the indications from the January 1948 mail survey mentioned above. To substantiate this assumption fully we would need to have surveys for each quarter of a crop-marketing season and occasional repetition in other years would be necessary before these assumptions would be firmly enough established to be used in adjusting reported data.

TABLE 2—*Grain stocks on farms expressed as a percentage of 1947 production as of January 1, 1948*

Crop	Board	January 1948 mailed survey	
		Weighted by board production [1]	Weighted by sample-indicated production [2]
	Percent	*Percent*	*Percent*
Corn	70	71	71
Wheat	31	28	30
Oats	61	60	58
Soybeans	28	28	28

[1] Survey stocks divided by production drawn from schedules usable for both items; those percentages weighted by States, using the Board's estimates of 1947 production.
[2] Per farm average of stocks and production expanded by Census number of farms, by States, to obtain total indicated stocks and production, from which the percentages were derived.

It is possible that any bias that may exist in stocks data reported by general crop reporters is generally consistent from year to year. Previous surveys have indicated that this is true for other types of information obtained through the general schedule. Thus the percentage change may be properly reflected by the results obtained from the general schedule.

Enumeration of Non-Respondents

It has long been recognized that more information is needed about reporters who fail to return schedules. Such information would be helpful in evaluating data from the reporters who do respond. As a part of this over-all project, approximately 50 non-respondents to the general schedule and 50 non-respondents to the special schedule were interviewed in each of the States of Indiana, Kansas, and North Carolina. These States have an annual State assessors' census from

which the special survey lists were drawn. In addition, 34 general-schedule non-respondents were enumerated in the State of Washington.

These non-respondents were selected in the following way:

1. Non-respondents to the general schedule were selected for interviewing in 10 counties in each of the above 4 States. The counties were selected in such a way that those with the largest number of non-respondents had a proportionately greater chance of being selected. Similarly, 10 counties were selected for the interviewing of the special-survey non-respondents in the 3 States mentioned above. The groups of counties were selected independently and only 4 counties were drawn from which both general-schedule and special-schedule non-respondents were interviewed.

2. Five non-respondents and several alternates were drawn in each county selected under (1), using a method of systematic sampling beginning with a random start. In a few instances, the number of non-respondents (general schedule only) was inadequate for the purposes of making county selections so it was necessary to combine two or more counties into a "pseudo" county.

The selected non-respondents were interviewed and, among other items, stocks data comparable to those secured by mail from the special and general schedules were recorded. A summary of the data obtained by personal interview is shown, by States, in table 3, together with the data from reporters who replied to the mail inquiries (special and general schedules).

Farm-stocks data obtained from the interviewed non-respondents were usually lower than those obtained from the respondents to the general and special schedules. Some of this difference may be attributed to the fact that the non-respondents were interviewed several days or weeks *after* the mail surveys were over. Even though enumerators were specifically requested to obtain stocks on farms as of April 1, it is possible that in some cases stocks on hand at time of interview were given.

Results from the 34 non-respondents to the general schedule who were interviewed in Washington State are also shown in table 3. The special-schedule survey was not made in Washington State. Moreover, there are no annual assessor censuses there from which an assessors' list could be drawn. Because of these facts it was not possible to show the same comparative data for Washington in table 3 as for the other three States. Therefore, the data for general-schedule respondents and non-respondents in Washington State are not included in the calculations upon which certain conclusions are made in this report. It should be noted, however, that stocks data for the 34 non-respondent farmers who were interviewed agree very closely with the reported data from the first mail response to the general schedule. But the eastern counties that were not enumerated could have influenced the results considerably because they constitute a heavy grain-producing area of Washington State.

Assuming that the general- and special-schedule non-respondents who were interviewed were representative of the entire group who did not respond, it may be concluded that the indications provided by mail contained an upward bias.

The assessors' list represented a systematically drawn sample from all of the farms in each of the three States. For the purpose of this study, it has been assumed that the results from the interviewed non-respondents can be considered representative of the entire non-respondent universe. Thus, "assessors' weighted" averages—obtained by weighting the percentage stocks on farms reported by the special-schedule (assessors' list) respondents and the interviewed non-respondents, by production weights for respondents and *all* non-respondents—should provide unbiased estimates of grain stocks on hand (percentage of previous year's production). These averages were more nearly in line with the results of the interviewed non-respondents because the non-respondent category had a much heavier weight in the computations.

Another series of indications obtained from this study in each of the three States was the "general weighted"—computed for the general schedule respondents and non-respondents in the same manner as described for the "assessors' weighted." Four indications were available for this study: (1) "assessors' weighted," computed as described, (2) "general weighted," computed as described, (3) as reported by respondents to the special mail survey, and (4) as reported by respondents to the general schedule.

Since the "assessors' weighted" averages are unbiased estimates, the departure of the (1) general (as reported), (2) "general weighted," and (3) assessors (as reported), from the "assessors' weighted" indicated the extent to which each

TABLE 3.—*Grain stocks on farms April 1, 1948, expressed as percentage of 1947 production (as indicated by respondents to the general schedule, assessors' survey, and interviewed non-respondents from both surveys)*

State	Corn	Wheat	Oats	Barley	Rye	Soybeans	Flaxseed
NORTH CAROLINA	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
General [1]	49. 5	20. 0	18. 5	22. 1	13. 3	21. 3	[2]
General [3] (N. R.)	43. 8	16. 9	9. 6	8. 1	6. 0	43. 6	[2]
Assessors [4]	48. 1	20. 1	20. 5	25. 6	34. 8	40. 3	[2]
Assessors [5] (N. R.)	39. 2	17. 9	5. 9	. 0	11. 4	11. 7	[2]
KANSAS							
General [1]	35. 2	22. 4	32. 5	33. 6	11. 3	18. 8	5. 2
General [3] (N. R.)	22. 5	13. 7	22. 6	25. 5	. 0	5. 5	. 0
Assessors [4]	30. 2	17. 3	28. 5	22. 3	17. 8	17. 5	5. 8
Assessors [5] (N. R.)	17. 2	12. 9	31. 5	17. 4	. 0	. 0	. 0
Interview survey [6]	23. 9	18. 3	22. 3				
INDIANA							
General [1]	41. 2	8. 7	33. 0	28. 4	16. 0	15. 7	
General [3] (N. R.)	38. 1	8. 6	36. 4	. 0	7. 4	8. 6	
Assessors [4]	39. 0	6. 4	30. 5	47. 3	5. 9	14. 0	
Assessors [5] (N. R.)	39. 7	5. 9	27. 4	. 0	1. 1	8. 0	
WASHINGTON							
General [1]	28. 1	7. 8	25. 1	17. 7	12. 3	[2]	[2]
General [6] (N. R.)		7. 7	25. 2	19. 3		[2]	[2]

[1] Respondents to the general schedule.
[2] Not asked.
[3] Interviewed non-respondents (general schedule).
[4] Respondents to the assessors' list survey.
[5] Interviewed non-respondents (assessors' list survey).
[6] Kansas March 1948 enumerative survey.

varied from these unbiased estimates. These estimates are compared graphically in figure 1 for each of the three States where non-respondents in both surveys were interviewed. Most of these indications, especially the results from the general schedule (as reported), were higher than the "assessors' weighted."

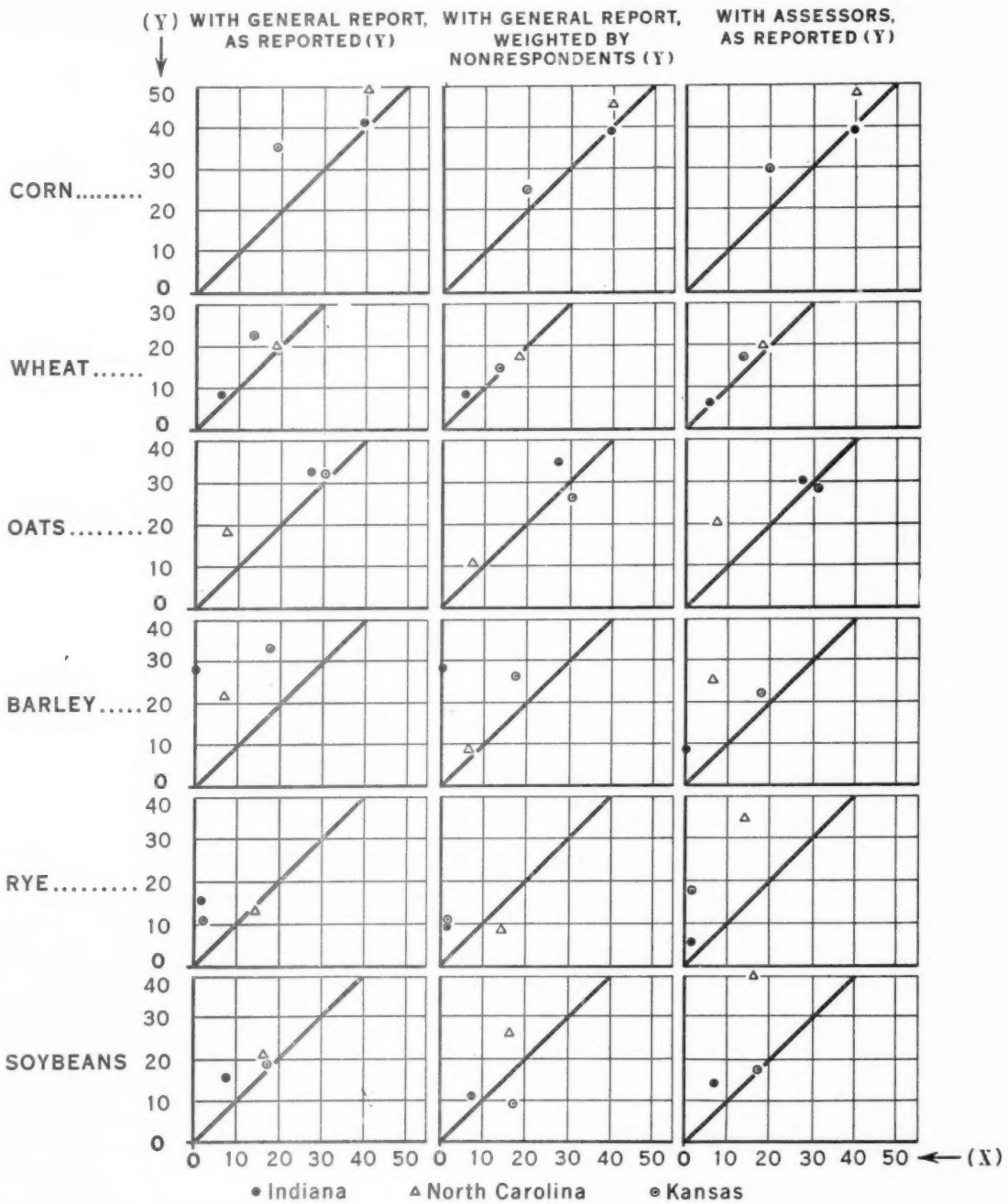
It is realized that a comparison of these indications for such crops as barley and rye may not be reliable in some States where the percentage of all farms having these stocks is small. Mailed surveys may sometimes include a few non-representative farms in districts that are heavily weighted. Likewise, results that would be obtained if several interviewed non-respondents who have abnormally small (or large) quantities of grain stocks on hand are included would distort the averages and comparisons as used in this study. But the *consistency* with which the results of the general schedule, and to a less extent the assessors' survey, are above the "assessors' weighted" indications, appears significant. This apparent bias is already being taken into consideration to some extent by the Crop Reporting Board when preparing its official estimates.

Operational Problems

One of the primary objectives of this study was to learn the operational difficulties and costs involved in conducting a survey of this kind, including the problems of locating non-respondents and reasons for non-response.

Little difficulty was encountered in locating non-respondents to the general schedule, as most of them were well-known farmers. Assessors' non-respondents were somewhat more difficult to locate. As the assessors' list used originally represented a selection from all farms in a State, the non-respondents from this list included some small and more-or-less unimportant farms, the operators of which were not very well known in their communities. Inquiries were made at stores, dwellings, and garages but the most effective method of locating the selected farms was to

COMPARISON OF ESTIMATES OF FARM STOCKS ON BASIS OF THE ASSESSORS, WEIGHTED BY NONRESPONDENTS (X)



U. S. DEPARTMENT OF AGRICULTURE NEG. 46965 BUREAU OF AGRICULTURAL ECONOMICS

FIGURE 1.

United States Department of Agriculture
Bureau of Agricultural Economics

Budget Bureau No. 40-4820
Approval Expires 5/31/48

APRIL 1948 SPECIAL INTERVIEW CHECK SHEET

(For use in interviewing nonrespondent reporters)

Name of reporter _____ Interviewer _____

Time interview began _____ a. m. / p. m. Ended _____ a. m. / p. m. Date _____

This is a general ☐ (assessors) ☐ reporter—check one.

This (general) reporter returned _____ reports past year and _____ past 6 months.

ASK BEFORE SCHEDULE

1. We recently mailed you a schedule of this kind—we wondered if you received it?
   YES ☐ (Ask 2) NO ☐ (Explain and ask schedule)
2. Did you fill it out and mail it back to us? YES ☐ NO ☐
   (Ask schedule data if answer is either yes or no)

ASK AFTER SCHEDULE

3. (Ask *only* those who did not return a schedule) Was there any special reason why you did not return the schedule? _____
4. (General reporters) Which of these questions do you think farmers find hardest to answer? (Why) _____

Now it's important for us to know a little about you and the farm you are operating.

5. About what year did you start operating this farm? _____
6. Do you own (check one): All ☐ part ☐ or none ☐ of this farm?
7. (General reporters) What is the total acreage in the farm you are now operating (including pasture and rented land)? _____ acres.
8. What do you get most of your cash farm income from? (Check one)
   Livestock ☐ Grain ☐ Truck ☐ Dairy ☐ Fruit ☐
   Other ☐ (Explain) _____
9. (a) Have you a radio? YES ☐ NO ☐
   (b) Telephone? YES ☐ NO ☐
   (c) Electricity? YES ☐ NO ☐
10. How old are you? _____ years.
11. (a) What was the last school you attended? (Check one):
    Grade ☐ High school ☐ College ☐ Other ☐ _____
    (b) (If grade school only) What was the last grade completed? _____ grade.
    (If attended high school or college) Did you graduate? YES ☐ NO ☐

(Use the back of this sheet for recording comments of reporters interviewed)

inquire at Post Offices or county PMA offices, both of which were very cooperative. In most cases, the non-respondents who were to be interviewed lived on rural mail routes. Some of these lived along or near the road that was being traveled. By making frequent inquiries of farmers along the road for several miles before reaching certain towns as to the territory covered by rural routes, some of the farms were located before going into the towns in which the routes originated.

The number of interviews per day varied considerably for such reasons as travel involved, difficulties in locating farms, and weather. An average of about five interviews (or one complete county) were completed per day, with 35 to 40 miles of travel required per schedule (including distance between counties). The time required to complete and record an interview, including time used for establishing friendly relations, averaged only about 21 minutes per schedule.

Based on what data we have at hand, the average cost per interview schedule was about $6. This included per diem subsistence, car mileage, and equivalent salary of the people who did the interviewing. It does not include analysis nor duplicating costs. About 80 to 85 percent of total

time involved was spent in finding those to be interviewed and going from one county to another. These costs are based on a relatively small number of non-respondents. We believe the cost per schedule would drop considerably and the over-all operations would be greatly improved as the number of non-respondents interviewed is increased.

Additional data relating to size and type of farm, age and education of farmers, and other items were obtained from each non-respondent who was interviewed. These collateral data are not to be discussed in this paper but a copy of the check sheet used in interviewing and recording this type of information is included.

Conclusions

Non-respondents were generally cooperative in supplying information; some expressed regret for not having returned their schedules. Very few gave specific reasons why they failed to return them. The most frequent general reasons given were that they were too busy or that they overlooked the schedule or neglected to mail it. Less than 5 percent indicated that the reason for non-response was no grain stocks to report.

This particular study provides additional support for the assumption of many of our statisticians that general crop reporters represent a type of farmer that might be expected to retain a relatively larger proportion of grain stocks for home use. Thus, indications from this source may contain an upward bias. Although the use of a more nearly representative list, such as the assessors' list, apparently eliminates some of the bias in results obtained by mail, the selectivity in the response to both the general schedule and the assessors' list apparently causes the mail returns to be biased in both cases. Consequently the use of representative lists alone is not sufficient to provide unbiased estimates without taking some account of the non-respondents to mail surveys.

The results from interviews with nonrespondents in the three States in which interviews were conducted, in relation to both the general and special surveys, indicate that the reported stocks on farms were generally higher than would have been the case had all schedules been returned. The "assessors' weighted" indication provided the basis for determining unbiased estimates; the accompanying chart shows the extent to which the mail surveys and "general weighted" indications departed from these estimates.

Although the study was of an exploratory nature, the feasibility of an approach of this kind was demonstrated. It is thought that the results obtained, relating to both grain stocks and collateral data, justified the time and relatively small cost involved.

It is believed that additional surveys of this kind, involving the interviewing of a larger number of non-respondents in more States, should be conducted in order that the conclusions of this particular survey may be more fully substantiated.

Agriculture and Strip Coal Mining

By George H. Walter

Strip coal mining does not cover much land area. Yet these operations produced about one-sixth of the total coal production of the United States in 1945. At the same time the mining operations have repercussions on the farms, the farm families, and the communities in the local areas.

STRIP coal mining is a rapidly expanding industry competing with agriculture for the use of lands that are underlain by suitable coal deposits. Although this method of mining has been practiced for many years, it was not until the development of the steam shovel that the industry became of major importance. World War I was a great stimulus to the small industry. Later, the development of the huge electric stripping shovels and draglines made it possible to strip-mine coal of greater depth. This fact increased the acreage of land in which the companies could operate and increased the size of the industry. The low labor requirement of strip mines per ton of coal produced as compared with shaft mines gave it further impetus in World War II when labor became critically scarce.

As the industry grew and its operations removed ever-increasing areas from agricultural uses, the conflicts in the interests of the strip-coal companies and the local people became increasingly evident. To date, at least five States have passed legislation to regulate the activities of strip coal-mining companies. Proposals for regulatory legislation have been considered by the legislatures of at least as many other States. These laws and proposals usually contain provisions both for regulation and licensing of mining operations and for requiring certain types of rehabilitation work on the stripped areas. Methods proposed or required differ greatly. They often indicate lack of understanding of the real problems involved or indicate the wishes of special interests—those of strip-coal companies, or their competitors, or persons who are opposed to stripping for other reasons.

Lack of sufficient information and understanding about the great variety of conditions under which strip coal mining is done is partially responsible for the diversity of the proposals for legislative regulation. In many cases, a more complete knowledge of the real situation would assist materially in working out mutually satisfactory solutions to problems arising out of coal-stripping operations. The following discussion of some of the problems and conditions indicates the complexity of the subject and the need for further study of a land-use problem which, although small so far as acreage affected is concerned, may have serious social effects in those areas where the coal-stripping activities are concentrated. Any future study of strip coal mining and its relationships with agriculture should consider the implications of these activities from both the private and the public viewpoint.

Current Situation

In areas where seams of coal lie relatively close to the surface, strip coal mining competes with agriculture for the use of the land. Coal is mined by the open-cut or stripping process in about half of the States and is an especially important industry in Pennsylvania, Illinois, Indiana, West Virginia, and Ohio, where large tonnages are currently produced by this method. About one-sixth of the total coal production for the Nation is now coming from strip coal mines.

Strip coal companies are gradually acquiring title, leases, or options for future mining operations wherever land has coal of suitable quality located not more than 75 feet below the surface. This involves much agricultural land. In some areas even deeper deposits are being mined by the stripping method and future development of new types of equipment may increase the maximum depth for economical stripping operations. The maximum depth economically profitable depends on the thickness of the coal seam. An acre of land underlain by a coal deposit 1 foot thick would contain about 1,800 tons of raw coal. Economically strippable coal deposits usually range from about 2 feet to more than 12 feet in thickness.

The average strip mine recovers about 6,000 tons of coal per acre stripped, indicating an average thickness of about 4 feet for the coal seams stripped.

Mining of an acre of coal by the stripping process usually removes considerably more than an acre of land from agricultural use. In the eastern strip-coal fields of Pennsylvania, Ohio, and West Virginia, the areas of strippable coal are often strips around the sides of hills at the level of the coal outcrop. Here the overburden, as the rock and soil covering the coal is called, is usually pushed downhill as the coal is uncovered by the first cut in the stripping process. If the slope of the hill will permit later parallel cuts to be made exposing more coal without removing an excessive depth of overburden, the material from the second cut is placed where the first cut was made. Stripping covers up some land where coal is not mined and often leaves small hilltops cut off or inaccessible for agricultural uses.

Strippable coal deposits in Illinois and Indiana are usually in relatively level and compact areas containing as much as several thousand acres. As operations in these areas continue in parallel cuts until the strippable area is exhausted, proportionally less acreage of agricultural land not underlain by coal is disturbed physically by the stripping operations. Because of their compactness and relatively large size, these operations, in some cases, may have equal or more serious effects than the stripping operations on hillsides.

The coal companies seldom have much difficulty in obtaining the rights to strip-coal lands. Where most or all of a tract of farm land is underlain by coal, the companies usually purchase title to the land. They may pay as much as $500 per acre for the property; the price usually depends on the thickness of the coal seam, its location, and the bargaining position of the seller. If the quantity of strippable coal is quite uncertain or if only a small part of a farm is underlain by strippable coal, a royalty lease may be made providing for a payment to the landowner of from 5 to 25 cents per ton of coal removed. Total payments per acre of coal are often higher from a royalty lease than from a purchase of the land title, but the payment per acre disturbed by operations may reduce the advantage of leasing over selling. To assure themselves of a future supply of strippable coal, companies secure options or purchase coal rights far in advance of actual stripping operations.

The agricultural value of lands underlain by strippable coal vary greatly. Many of the strippable areas that have been worked in the Eastern States were either forest or pasture lands. The strip-coal deposits of southern Indiana and southern Illinois usually are under relatively poor clay-pan soils. In contrast, some of the areas being stripped in western and northern Illinois contain very highly productive prairie soils. Most of the strip-coal deposits of Missouri and Kansas are under medium to low-grade agricultural lands.

Extent of Stripping Operations

Current stripping operations remove coal from 10 to 15 thousand acres each year. In the process of strip mining, probably about one-half again this acreage is made unusable for future agriculture unless rehabilitation efforts are successfully carried out. Although the greatest acreage affected by strip coal mining is currently in Pennsylvania, the greatest effect on agriculture is probably found in Illinois, where the land being stripped is of higher agricultural quality. Current coal stripping in Illinois is at the rate of about 3,000 acres of coal per year, with possibly 500 to 1,000 additional acres changed from agricultural to mining uses in the stripping process. About two-thirds of the Illinois lands now being stripped were in cultivated crops before they were bought by the coal companies. The remaining third was primarily pasture. To date, about 38,000 acres have been stripped in this State.

The effect of removing these lands on the national or State agricultural production is negligible so far, when compared with the total production of any crop. The dollar value of the agricultural production from the land before the stripping would be far less than the value of the 6,000 tons per acre of coal obtained by stripping. In both cases, however, there are costs which must be subtracted from the gross income before proper comparisons can be made. Too, agricultural income is a re-occurring benefit, whereas coal stripping consumes almost the entire value of the land. No figures are available on costs of strip coal mining, so it is now impossible to assess from a public viewpoint the relative net benefits.

From the public standpoint, strip coal mining is an example of competition between producers of

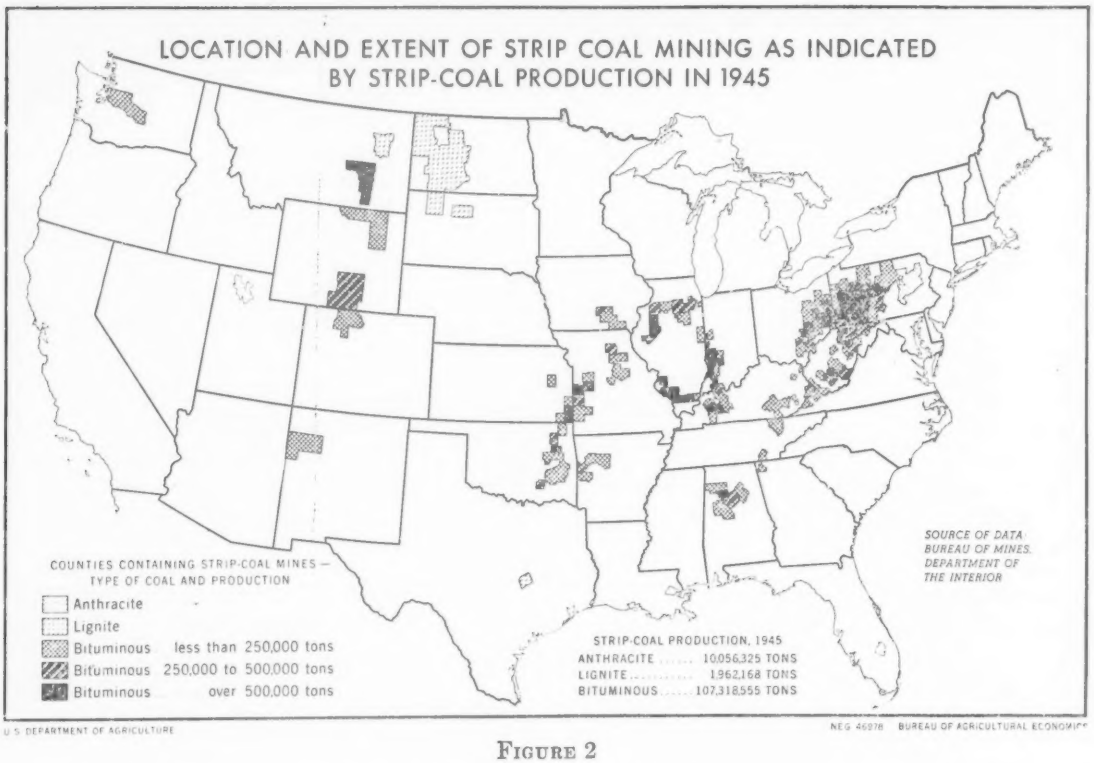

LOCATION AND EXTENT OF STRIP COAL MINING AS INDICATED BY STRIP-COAL PRODUCTION IN 1945
COUNTIES CONTAINING STRIP-COAL MINES — TYPE OF COAL AND PRODUCTION
Anthracite
Lignite
Bituminous less than 250,000 tons
Bituminous 250,000 to 500,000 tons
Bituminous over 500,000 tons
STRIP-COAL PRODUCTION, 1945
ANTHRACITE ..... 10,056,325 TONS
LIGNITE ..... 1,962,168 TONS
BITUMINOUS ..... 107,318,555 TONS
SOURCE OF DATA: BUREAU OF MINES, DEPARTMENT OF THE INTERIOR
U.S. DEPARTMENT OF AGRICULTURE
NEG. 46978 BUREAU OF AGRICULTURAL ECONOMICS

FIGURE 2

two types of natural resources, both of which are currently in high demand. Strip coal mining is a means of utilizing coal resources which either could not be recovered by underground or shaft mining or, where they could be mined by an underground operation, only between half and two-thirds of the coal could be so recovered. Any social assessment of the merits of strip coal mining must consider whether current coal production is of greater importance than the continuous crop production from the strip-coal lands.

Usual Effects on Immediate Locality

Strippable coal deposits are usually concentrated in rather compact and limited areas where one or more valuable coal seams are near the surface. The importance of strip coal mining to the people in these limited localities greatly outweighs its importance on the national level. The physical nearness of stripping operations affects local people both financially and emotionally and it affects them as a community. Misinformation and the relative newness of large-scale stripping operations have been responsible for many exaggerations and misstatements concerning the destructive effects to be expected on the local economies as a result of strip coal-mining operations. Groups representing coal interests stress the benefits of strip mining. Local farmers or civic groups usually stress the disadvantages to the group they represent. The public often becomes bewildered and may promote legislation without having sufficient basis for their efforts or sufficient evidence to guide them.

Studies Made

To understand better the conflicting interests when a currently more profitable land use, such as strip coal mining, displaces agricultural use, a detailed study of three important strip coal-mining areas in Illinois was undertaken jointly by the Illinois Agricultural Experiment Station and the Bureau of Agricultural Economics. The results indicated that (1) coal-stripping operations have several noteworthy local effects and (2) few of these will be felt very far beyond the

trading areas or vicinities in which the mines are located.

The widespread effects of strip coal mining include competition with shaft mining and other fuels, movements of population into areas to supply trained mining personnel, and associated effects on business. Local effects include a gradual decrease in farm production and farm employment as the land is stripped, associated changes in service industries, and changes in requirements in public services and costs.

Early Effects

For any specific area in which a large-scale stripping operation is begun, the immediate effect is an influx of specialists to construct the mine plant usually known as a tipple, to operate the stripping and coal-processing machinery, and to make geological explorations to determine the exact limits of the coal deposits. Only a few farmers are displaced in these initial operations and they are often included among the local people employed in semi-skilled or unskilled jobs around the mine. Local concerns benefit from the influx of workers, the local purchase of supplies, and the increased employment of local people. Within a year, local taxing units benefit by additions to the assessment rolls of new construction and property of the coal companies.

Local farm people first notice the effect of the coal mining when lands are optioned for purchase by the coal companies. Speculation on coal possibilities may increase the local land values and have a disturbing effect on the communities. Farmers who have given options to mine their land no longer keep up improvements and are likely to lose interest in the community affairs. As mining progresses, it disrupts the neighborhood exchange of labor, road transportation, and school-district organization and operation in the areas adjoining and including the stripping operations.

Farmer Displacement Slow

When coal companies option or purchase lands underlain by coal, they usually offer to pay more than the current value for purely agricultural lands in that neighborhood. As the farm-land owners seldom know the extent of the acreages underlain by strippable coal and as coal companies option many acreages that have questionable underlay, the effect is often to cause an immediate inflation in farm land values in the vicinity of stripping operations. Owners who sell land often find it necessary to go some distance to buy other land at its agricultural value. There is also evidence of considerable speculation in land in areas adjoining or near strippable coal fields.

A typical large strip-coal mine in Illinois removes coal from under the equivalent of about one medium-sized farm per year. Operations at any one time follow coal deposits and normally cross parts of what have been several farms, but the rate of farmer displacement is relatively slow. The farmers are usually displaced so slowly that no major relocation problems occur.

A strip coal mine that has operated for several years will usually have completely stripped at least a part of the coal field. The boundaries of the coal deposits will be known and conditions will begin to stabilize. The unstripped portions of mine holdings are usually either rented to local farmers or farmed in connection with other land holdings of the coal companies or their officers, or they are left idle.

Land Values and Taxes

As long as the coal companies continue to operate in the area, total taxes paid by coal companies on their holdings will continue to be greater than were the taxes paid on the acreage before the stripping. Values on lands not underlain by coal either return to the agricultural level or to a lower level that reflects the usual disinclination of prospective purchasers to own land near the spoil piles of strip mines.

When a strippable coal deposit becomes exhausted, the coal companies move on, removing their equipment and improvements. The remaining spoil piles and the final cuts where coal was removed have little productivity. In nearly every State, except Illinois, such stripped lands are reassessed after stripping at levels far below their former assessed values when in agricultural uses. Insofar as services, as for roads and schools, can be cut by corresponding amounts as a result of a reduction of needs, the reduced tax base would have no effect. Often, however, removal of the mining industry results in unemployment for these local workers until adjustments take place in population. Unless reorganization is carried through, school costs continue at high levels. Too often in the past roads that should have been

abandoned as unneeded have been replaced after the stripping is done, in their old location, with a resulting expense for continuing maintenance costs that is far in excess of their use value. Adjustments take time and add to the costs of local government during the transition period. Local people expect a larger part of the tax burden to be carried by the remaining nonstrip mine property in the area than the acreage carried before the operations.

As most farmers consider strip-mine spoil piles to be "poor neighbors," owners of adjoining farms often claim that their land values are lowered, thus causing them an uncompensated-for loss of equity value. These same landowners often fear that their taxes after the mining ceases will be increased to replace the revenue no longer obtainable from the strip-mine lands. Few of these owners recognize that although their claims regarding the future may be true, they benefit while the strip mines operate from lower tax rates than probably could be expected if the coal companies had not added materially to the tax base.

Abandonment of some local roads and schools in the mined areas may necessitate some reorganization of local government functions. Temporarily this may inconvenience local people but the final result may be to facilitate or speed up needed reorganization of local government functions.

Possibilities of Rehabilitation

Farmers and other local people dislike to see good agricultural lands reduced to spoil piles. Objections to strip coal mining are usually more pronounced in areas where the land being stripped is relatively good cropland than in areas where stripping is largely in forest lands, pasture lands, or poor croplands. In nearly all areas, however, there is significant public support for requiring coal companies to rehabilitate lands after stripping operations have been completed. Coal companies often undertake some kind of rehabilitation efforts on the stripped areas.

Kinds of rehabilitation advocated range from requiring complete restoration of the original topography, including replacement of topsoil, to the less intensive practice of planting of the stripped areas to grass or trees. To date, efforts of the companies toward rehabilitating stripped areas have consisted primarily of planting trees. A few areas, especially in Illinois where soil conditions are favorable, have been seeded to pasture. Such seedings have been made both on partially leveled spoil piles and on ungraded spoil piles. Some experimental leveling has also been done in Illinois and other States and a few companies have made limited experiments to learn the relative suitability of leveled, partially leveled, and unleveled spoil piles for field crops, pasture and hay, forest trees, orchards, and vineyards. A few stripped areas have been developed as recreational areas and as game refuges.

The type of machinery that has been used and the nature of the overburden greatly influence the selection of rehabilitation practices. When the entire layer of overburden is removed by an electric shovel, the roughness of the spoils increases with the depth of the coal. However, new methods of mining, involving tandem operations (a dragline and an electric shovel working together), often result both in more selective replacement of overburden with the rock covered by the finer soils formerly on top and in less rugged spoil piles. Areas where these new methods have been followed may offer far more favorable conditions for all types of rehabilitation measures. Future developments in mining methods will influence efforts toward rehabilitation.

Where the surface of the spoil piles contains a high proportion of soil materials with little rock or shale or toxic and acid pyrites, pastures can be developed within a few years after the surface is seeded to sweetclover and other legumes and to grasses. The same type of area is sometimes suitable for orchards, or vineyards, or forest. Whether partial leveling before these types of rehabilitation are undertaken is economically justified will depend on local conditions, including the nature of the spoil piles.

Spoil piles of a suitable physical nature can be profitably developed for pasture if they can be used in conjunction with adjoining cropland. Limited experience by farmers in Illinois, Indiana, and Ohio indicates that spoil-pile pastures are more suitable for beef cattle than for other types of domestic meat animals. Successful utilization of any pasture development often depends on whether adjoining landowners are interested in using such pastures for beef cattle.

For the many spoil banks that are left rough and rocky when the mining is finished, forest and wildlife are the most suitable uses. During the

last 25 years, coal companies have made forest-tree plantings on stripped areas with varying degrees of success. Other areas have been left to become reforested by nature. Early plantings were primarily of black locust, and later damage by borers was very destructive. Later plantings have included greater proportions of conifers. None of these conifers have reached maturity but some of the stands in southern Indiana and Illinois seem promising. Natural reseeding often results in thin stands, frequently containing a large proportion of cottonwood, intermixed with other locally common hardwoods. As reforestation requires no leveling it has been the most popular type of rehabilitation with the mining companies. Experimental research by the U. S. Forest Service, State conservation departments, and the coal companies, is under way in the North Central States to determine the types of trees best suited to each of the major types of spoil piles. Wildlife, both vegetative and animal, gradually develops in stripped areas that are not used for pasture but neither trees nor wildlife are likely to restock naturally in areas used for pasture.

In some cases, where strip mining has resulted in the development of artificial lakes, in the final cuts, or in roadways, or among the spoil piles, the tract has been developed for recreational uses by private or governmental units. Water is usually the principal attraction of these parks, for, so far, they have been in localities that lack natural lakes or other recreational outdoor places. The roughness of the spoil piles limits their attraction for hikers and hunters, and picnic parties usually prefer more developed sites.

Naturally revegetated spoil piles furnish suitable cover for wildlife. Where wildlife refuges are needed they could be further developed for such uses. A few areas, however, will not be suitable even for wildlife as their spoil piles contain acids or other toxic substances that limit or make impossible nearly all types of plant growth. Such piles will remain barren wastes until the toxic or acid substances have leached away. Fortunately, so far a relatively small proportion of the strip-mine spoil piles have been chemically unsuited to plant growth.

Leveling Activities

Only a few small stripped areas have been leveled and returned to farm uses. Strip coal-mining companies have seldom leveled land they own after the coal has been removed. In a few known cases, farmers owning lands underlain by coal have permitted mining on a royalty agreement which also provided for the leveling of the spoil piles. The inclusion of this requirement reduced the royalty payments per ton of coal removed. It appears that these reductions in royalties have ranged from $400 to $1,000 per acre—amounts usually far in excess of the prevailing prices for other lands of comparable quality in the area. Coal companies claim that the cost of leveling is greater than the value of the resulting lands and, for this reason, they oppose legislation requiring them to level after the stripping is completed. Arguments advanced against leveling point out the high rock content of much of the overburden, the low nitrogen and organic matter content of the resulting soils, and the problems of drainage and settling. Where leveled areas have been planted to field crops or orchards, and a moderate quantity of nitrogen fertilizer has been used, results appear physically promising. Whether the production from leveled acreages can justify the cost is open to question. To date, the total area that has been leveled is probably less than 500 acres.

Conclusions

Strip coal mining is an extractive industry which will probably continue as long as suitable coal deposits exist. It is increasingly recognized by both companies and citizens that the industry has an obligation, however, to help so far as possible to minimize the effects of its operations on the people in the communities in which it operates. It is of importance not only to the local people and the coal companies but to the general public as well that the stripped lands be returned to an economically sound and productive use after mining operations cease. Society has the ability through legislation to protect the interests of any individuals or the public as a whole if future research discloses such need. Effort should be made, however, to avoid discriminatory or penalty legislation that is not in the interest of either the strip-coal companies or the public as a whole. In order to best serve all interested parties, considerable additional information and analyses must be obtained relative to the effects of coal-stripping operations and the practicable uses for stripped lands.

Book Reviews

Introduction to Agricultural Prices. By WARREN C. WAITE and HARRY C. TRELOGAN. Burgess Publishing Co., Minneapolis, 1948. 227 pages.

"THE essential feature of prices from the standpoint of entrepreneurial decisions lies in their variation." Operating on this premise Doctors Waite and Trelogan have written a readable and well-organized text to (1) identify the problems arising from price variations and (2) explain how and why such variations occur. After the customary courtesy to the "equilibrium theorists" the authors proceed to do what they started out to do anyway—to examine rather intensively the "problems of particular interest to the entrepreneur." The plan has enabled them to evolve an unusually good text in agricultural prices and a superior piece of reading material for students in elementary economics.

Essentially, the volume is one from which a student can obtain a clear picture of the scope and importance of agricultural prices in our economy. Likewise, he will find a rather well-knitted, logical explanation of the forces causing the price structure to be one thing instead of another. The authors have emphasized the importance of a full understanding of the interrelationship of economic phenomena on the part of anyone attempting to explain or analyze the price structure for any farm product. It appears, therefore, that the brief treatment of statistical procedures is justified on the basis that a "tool" is of little importance to one who does not know how to use it. Further weight is given this point of view by the following statement:

"In using statistical procedures in the analysis of prices the student must keep constantly in mind that the numerical or graphic results, no matter how good they may be, tell nothing about the reasons for the relationships. These reasons must be found in the general knowledge of the relationships and the general logic of the situation . . . ."

Organization of the subject-matter into chapters follows a rather conventional pattern. The illustrative material and the descriptive analysis reflect the broader background of the authors in economic theory and price-regulatory work. Such chapters as "Price Determination in the Individual Market," "Organization of the Market and Price Formation," and "Futures Trading and Prices" are very well done.

The authors chose to deal with the role of government in price-making in their chapters "An Experience with Price Control" and "Price Policy Applied to Agriculture." This fact makes more serious the virtual omission of such subjects as governmental fiscal policies and food and fiber as bargaining tools in international policy. These two activities of government deserve more than a passing comment.

The authors detracted from their good work by using the Preface to bow modestly to the ghost that lurks in the subconscious mind of almost every economist. It appears to the reviewer that the following might well have been omitted:

"No assumption has been made that the business management of agricultural marketing enterprizes accepts, or is even conscious of, the principles and generalizations herein presented when they conduct their day to day activities. Nor is it contended that agreement or familiarity with this subject matter will fit the student for a position of responsibility in an agricultural marketing enterprize . . . ."

Viewed as a whole, the work is superior in most every respect. It fills the need for an up-to-date, teachable text in this phase of economics, and it should help many an overworked and underpaid college teacher to put new life into the supply-demand part of his course in elementary theory. Teachers interested in training students for work with agricultural-marketing organizations or for marketing research will find this book a valuable teaching aid.

D. B. DeLoach

Labor Productivity Functions in Meat Packing. By WILLIAM H. NICHOLLS. The University of Chicago Press, Chicago. 1948. 256 pages.

ALTHOUGH this book is not likely to be widely read, there are several reasons why it is worth attention from researchers working in the agricultural marketing field, whether their interest may be chiefly theoretical, statistical, or some combination thereof.

On the surface this is simply a study of the cost of labor-productivity functions involved in the fresh-pork operations of a Mid-western meat-packing plant in the now distant years 1938–40. The author's objectives are modest. Admittedly, the scope of the book is limited for it deals only with the statistical relationships between labor input and the physical volume of output as demonstrated by one meat-packing plant through two seasons of operations. Furthermore, the author admits that his own "veneer of . . . sophistication" in the use of statistical techniques is not yet thick enough to suggest that any substantial contribution to statistical methodology is made, although he does use as advanced statistical methods as the data themselves will support.

The analysis does attempt to make a limited but significant contribution to the economic theory of the firm. Attention is called to the fact that analytical studies in this field have traditionally measured labor in terms of manhours, whereas actually two dimensions are involved—the number of workers and the average hours per worker. Each of these dimensions is presumably subject to the law of diminishing physical productivity and each can, within limits, be substituted for the other.

The author doubts whether the particular results of the study are appropriate for direct application to problems of either private or public policy. But he does raise some questions with respect to public labor policy, which need to be further considered, especially the question as to whether the shortening of the average work week—or the substitution of men for average hours per worker—may not have proceeded in some instances to the point where economic efficiency is affected.

This might be considered a *practical* study, despite the very modest claims the author advances and the age of the data themselves. However, Dr. Nicholls' approach to the problem is essentially theoretical and he has endeavored to check his theoretical reasoning by the application of modern statistical techniques. As a result, agricultural researchers will find the chapter on Critique of Statistical Methodology as interesting as the opening chapter in which the summary and conclusions of the study are outlined.

The author undertook to check his theoretical analysis by the application of two statistical formulae, one in arithmetic terms with relationships stated as second-degree curves and the other in logarithmic form. His conclusion here is simple and honest indeed, the two approaches for the most part did not yield consistent results. As a matter of actual fact, there was a question as to whether simple straight-line relations would not equally well have described the relationships existing within the ranges covered by the available data. That is, the operations of the particular plant seem to be centered around a relatively efficient norm, so that the laws of diminishing returns of productivity came into play to only a very small extent, if at all. Because of this inconsistency the author concludes that even more advanced statistical techniques, such as simultaneous functional equations, would not be likely to yield production functions much different from those already determined.

The use and discussion of standard tests of significance is also of considerable interest. Statistical tests for significance are applied to all of the many relationships and correlations worked out for each of the several subgroups into which the data were divided, even though there was evidence of considerable non-randomness and even though the author came to the conclusion that important differences in the distribution of men and hours between the two seasons supported the view that the universe had actually changed from 1938–39 into 1939–40. Such a conclusion may seem innocent enough. However, it surely underlines the difficulty of applying statistical techniques in some practical fields since it is likely that few economists would ordinarily assume significant changes in the underlying forces influencing the economy between 1938–39 and 1939–40.

Altogether, the author is exceptionally honest. He gives his reasoning, he describes his data, he checks his answers statistically, and he sets down what he found. There are times when we could wish other researchers might do as much.

O. V. Wells

Future Food and Agriculture Policy. A Program for the Next Ten Years. By JOHN DONALD BLACK and MAXINE ENLOW KIEFER. McGraw-Hill Book Company, Inc., New York. 1948. 348 pages.

AT THE League of Nations Assembly in 1934, the present Viscount Bruce raised a question that has been quoted many times since: "Is it not possible to marry health and agriculture and, by so doing, make a great step in the improvement of national health and, at the same time, an appreciable contribution to the solution of the agricultural problem?" In 1948, Black and Kiefer have provided a study that "undertakes to combine these two important interests, the well-being of farming folk and the better nutrition of mankind, and outlines methods and procedures in both the national and international spheres of action that will achieve these two objects together."

This is a book of extremely broad scope that draws on a very large number of sources and touches on a multitude of topics. Because of this, a brief review must partake more of the nature of a notice than of a critical appraisal.

Part I "undertakes to present the main facts about the economic condition of agriculture and about food consumption and nutrition as they were in 1947 or could be expected to be in the succeeding ten years. Part II then divides the over-all problem of food and agriculture into its parts and examines each with some care." These parts, as indicated by the chapter headings, are: food and population, agriculture and the general economy, instability in agriculture, conservation of agricultural resources, low-income families in agriculture, the malnourished groups, food needs of the United States, food production potential of the United States, food needs and production possibilities in other countries, food distribution, and food targets. "Part III begins by outlining the food and agriculture programs in operation in 1947, first in the United States, and then in other countries; follows with an attempt at a program that selects from these the elements that are useful in a continuing program and fits these together into an integrated whole, . . . and concludes with an attempt to show how such a program could be adapted to some other countries and fitted into the international undertakings with respect to food and agriculture then being considered." Part IV deals with the execution of the program in the United States, with special reference to the roles of producers, consumers, processors and distributors, labor, other groups (such as the medical profession), and the Government.

Undoubtedly, Chapter 21—A Balanced Food and Agriculture Program for the United States—will evoke the greatest interest among agricultural economists. One needs to read the whole program to get its full import, but a number of salient points may be mentioned. The program is one for food *and* agriculture, financed by a joint appropriation, that involves simultaneous and supporting attack on the twin objectives of stabilizing farm incomes and improving the Nation's diet.

On the farm side, individual producer quotas and support prices, in the current sense, are abandoned. Instead, Black and Kiefer suggest that producers be guaranteed a price for a specified total crop and be paid the difference between the market price and the guaranteed price ("total price"), except that the proportion of a farmer's marketings on which the compensatory payments would be made are proportionately reduced to the extent that the actual crop (plus excess carry-over at the beginning of the year) exceeds the total crop. Payments to farmers would be principally in the form of aids for a wide variety of purposes, ranging from production adjustments, such as improvement of pastures, to consumption adjustments, such as better water supply for the family.

Most of these aids could be provided on a matching basis, and all aids for production adjustments would be available only on the basis of an approved farm plan. Payments would be accumulated as credits, and if drawn upon in depression periods would have desirable countercyclical effects.

On the consumption side, supplementary measures of food and fiber distribution would be instituted. The following order of preference is suggested by the authors: public education in nutrition; school feeding; provision of specially needed foods for mothers, infants, and pre-school children; in-plant feeding; and stamp programs, which would be generally more selective than the Aiken Plan except in periods of severe unemployment.

This book touches on such a variety of topics that the treatment of some problems may be regarded as sketchy or inconclusive, particularly

by specialists in the various fields. For example, the discussion of the appropriate level for the setting of "total prices" still leaves this crucial question rather wide open. However, when one views this study as a whole, it must be adjudged both salutary and stimulating. It should prove salutary to those who are perhaps too well satisfied with the limited objectives of current agricultural programs and the attendant devices of goals, quotas, support prices, diversion programs and the like. It will prove stimulating to those who feel the need for a fresh start and new perspective. Certainly it will add fuel to the current argument about compensatory payments versus price supports.

James P. Cavin

A Survey of Contemporary Economics. Edited by HOWARD S. ELLIS. Published for the American Economic Association by the Blakiston Company, Philadelphia. 1948. 472 pages.

WITH this volume the American Economic Association is striving to answer the persistent and pervasive plea for a way of "bringing one's self up to date." The primary purpose of the book is "to provide to the economist outside a particular field an intelligible and reliable account of its main ideas—both analytical devices and their practical application to public policy—which have evolved during the last ten or fifteen years."

The volume includes heretofore unpublished essays on 13 topics by widely known economists; the writer in each case had the benefit of criticism by two fellow economists. Unfortunately, it was decided that space limitations precluded printing the critics' comments; they have been used by the author as a basis for revising his statement. Undoubtedly many of the chapters would have better presented the recent developments if the differences of opinion between the author and the critics could have been given. This is especially true for those areas which have been characterized by widespread disputes.

Whether the book will achieve its primary purpose depends on the success with which the material on each topic is presented. To succeed, each essay needs not only to enumerate the recent developments in the field but also to interpret these materials so that the reader comprehends them.

The first essay, Value and Distribution by Bernard F. Haley, is an unfortunate first choice even though a great number of the most significant recent advances in economic theory have occurred in this field. In an apparent interest to exhaust the literature on the new thinking in the area, the author has developed his presentation more as an annotated bibliography than as an essay. To comprehend all the points touched by this chapter the reader will have to be quite familiar with the cited literature or willing to read a large number of the materials mentioned in the footnote references.

On the other hand, Chapter 7, Economics of Labor by Lloyd G. Reynolds, is a very readable and informative discussion. The author not only points up the significant contributions made by recent published works but also strives to fill in the gaps by drawing on his knowledge of research in progress at numerous institutions.

Chapters 3, 5, and 8 will be read with great interest by economists in the Government. J. K. Galbraith's discussion of Monopoly and the Concentration of Economic Power, in Chapter 3, is a fluent interpretation of Thurman Arnold's Trust-Busting and the TNEC hearings against a backdrop of recent developments in the theory of monopolistic competition. In Federal Budgeting and Fiscal Policy, Arthur Smithies reviews "the spoken as well as the written word—much . . . is an attempt to systematize what has been discussed in government circles, and especially in the Bureau of the Budget, over a number of years." Carl C. Shoup's discussion of the Development and Use of National Income Data points out the advances both in national income theory and in the compilation and publication of national income data during the past decade.

William Fellner's Employment Theory and Business Cycles, the second chapter, is a satisfying review of the developments in the theory of employment since the date of publication of Keynes, *The General Theory of Employment, Interest and Money.* He makes a special plea for

including problems of the cost-price structure in the theory of employment.

Price analysts will find stimulation in Joe S. Bain's essay, entitled Price and Production Policies, which maintains that "We are currently long on hypotheses and relatively short on discovery."

Henry H. Villard's review of Monetary Theory covers (1) the "decreased interest in the quantity equation," (2) "the concepts of monetary equilibrium which were developed as alternatives to the quantity equation," (3) changes in the "explanation of the determination of the rate of interest," (4) "financing of the war," and (5) "the heritage that the war has left us."

Lloyd A. Metzler skillfully summarizes both the recent empirical studies and the resulting theoretical revisions in The Theory of International Trade.

Two articles on the use of mathematics in economic analyses are included. Paul A. Samuelson assumes that Dynamic Process Analysis can "best be appreciated from a study of concrete examples." In addition to the elucidation of a half-dozen general models, he gives "a brief summary of the significance of past accomplishments in this field for future developments of economic science." Wassily Leontief's chapter, Econometrics, is in that refreshing style familiar to all who have studied with him. He demonstrates the promise of econometrics in making our assumptions more realistic and in putting content in the many conditional propositions by couching them in probability terms.

The book ends with Abram Bergson's survey of Socialist Economics and David McC. Wright's The Prospects for Capitalism. The former first presents various views on welfare economics; the works of Pigou, Marshall, Pareto, Hicks, Barone, Dobb, and Bergson are drawn on. He proceeds by discussing various criteria which a Central Planning Board could use in determining whether maximum general welfare were being achieved; the familiar writings of Lange and Lerner are used heavily. In the last chapter of the book, Wright concludes that he "does not . . . see that capitalism is now suffering from any basic functional weaknesses in the sense of immutable laws preventing it from working. Actual results, however, depend upon the adoption of reasonably intelligent policy."

Although some chapters appear to be deficient as narrative summaries of recent developments, every economist whose work is specialized will undoubtedly find that the book contains a wealth of information to aid him in catching up. No doubt the hundreds of candidates for higher degrees in economics will find the book a welcome companion during the "eleventh hour."

Howard L. Parson

Research Publications in Agricultural Economics issued by The Bureau of Agricultural Economics and Cooperatively by The State Colleges, July through December 1948. [1] [2]

ARKANSAS AGRICULTURAL EXPERIMENT STATION. LAND TENURE IN THE SOUTHWESTERN STATES. A Summary of Significant Findings of the Regional Land Tenure Research Project. Ark. Agr. Expt. Sta. Bul. 482, 31 pp. Fayetteville. October 1948. [Printed.] Agr. expt. stations of Miss., La., Okla., and Tex., the Farm Foundation, and the USDA cooperating.

This is the summary chapter of "The Social and Economic Significance of Land Tenure in the Southwestern States" to be issued by the North Carolina Press. It was prepared by Harold Hoffsommer.

BRODELL, A. P., and EWING, J. A. USE OF TRACTOR POWER, ANIMAL POWER, AND HAND METHODS IN CROP PRODUCTION. F. M. 69, Bur. Agr. Econ. 32 pp. July 1948.

Text and tables show an increase in numbers of tractors used in crop production from 246,000 on January 1, 1920, to 2,800,000 on January 1, 1947. There was a corresponding decline in numbers of work animals used. From a peak of 26,723,000 head in 1918, work animals dropped to 9,151,000 head on January 1, 1948.

CHRISTENSEN, R. P. EFFICIENT USE OF FOOD RESOURCES IN THE UNITED STATES. U. S. Dept. Agr. Tech. Bul. 963, 98 pp., illus. Oct. 1948. [Printed.]

[1] Printed reports are indicated as such. All others are processed. [2] State publications may be obtained from the issuing agencies of the respective States.

Central question under study: What adjustments in production and consumption of food products would be necessary in the period ahead to provide better diets and satisfy tastes and preferences as fully as possible? A section called, The Meaning of It All, concludes the text. (A Bankhead-Jones special research publication.)

FISCHER, C. M., and DELOACH, D. B. CONSUMER RESPONSE TO THE MARKETING OF CUT-UP TURKEY. Oreg. Agr. Expt. Sta. Bul. 457, 32 pp., illus. Aug. 1948.

Report of a study of the possibilities of marketing large tom turkeys in cut-up form. Purpose was to determine whether demand for these turkeys could be increased by marketing in this way. (BAE cooperated under Research and Marketing Act funds.)

GOODSELL, WYLIE D. FARM COSTS AND RETURNS, 1945–47. COMMERCIAL FAMILY-OPERATED FARMS IN 6 MAJOR FARMING REGIONS. 18 pp., illus. F. M. 70, Bur. Agr. Econ. September 1948.

One of a series which presents information on shifts in production and changes in farm organization, practices, methods, and efficiencies in production, mechanization, technological developments, prices, costs, and returns on 14 types of farms by type, size, and location.

HOLMES, IRVIN, and HANDY, RUSSELL P. LOCAL MARKET VEGETABLE SUPPLIES FOR THE NEW YORK METROPOLITAN AREA, BERGEN COUNTY, NEW JERSEY, 1947. 59 pp., illus. Bur. Agr. Econ. July 1948.

This is the first report of a project under the Research and Marketing Act of 1946 which is intended to improve procedures for forecasting and estimating market supplies of vegetables. Factual information obtained to date is presented here for use in planning further studies.

HOWELL, L. D. ANALYSIS OF HEDGING AND OTHER OPERATIONS IN GRAIN FUTURES. U. S. Dept. Agr. Tech. Bul. 971, 83 pp., illus. August 1948. [Printed.]

Shows: (1) relationships between cash prices of grain and prices of grain futures; (2) protection afforded by futures as hedges; (3) gains and losses from transferring hedges and from spreading operations; and (4) influence of futures on the stability and level of prices.

HOWELL, L. D. MARKETING AND MANUFACTURING MARGINS FOR HIDES AND SKINS, LEATHER AND LEATHER PRODUCTS. U. S. Dept. Agr. Tech. Bul. 961. 87 pp., illus. July 1948. [Printed.]

One of a series on marketing margins and costs for agricultural products. Deals with spread between prices of hides and skins and prices to consumers for finished leather products, costs involved, and possibilities of reducing them. Useful in apportioning efforts to increase efficiency and reduce costs.

JOHNSON, HUGH A., ROBERTSON, LYNN S., and SICER, J. W. PROFITABLE POULTRY MANAGEMENT ON CENTRAL INDIANA FARMS. Indiana (Purdue) Agr. Expt. Sta. Bul. 531, 64 pp., illus. June 1948. [Printed.]

Describes the place of poultry on farms in central Indiana, the general level of production efficiency, and outstanding causes for success or failure of the enterprise. Appraises production potential in view of feed and labor competition and probable future demand. (BAE cooperating.)

JOHNSON, SHERMAN E. CHANGES IN FARMING. 107 pp., F. M. 58, revised, Bur. Agr. Econ. June 1948.

Revision of Changes in Farming in War and Peace, issued in 1946. Analyzes changes during interwar and war years and includes production experience through 1947. Forces back of the large increases in production are appraised and their peacetime implications evaluated.

LARSEN, HAROLD C., and JOHNSON, NEIL W. MANAGING FARM FINANCES. U. S. Dept. Agr. Misc. Pub. 652, 69 pp., illus. September 1948. [Printed.]

A general handbook of information for use by farmers when investing or borrowing money, and by their advisors. Summarizes things to be considered in deciding such matters and provides a basis for viewing and thinking about important financial problems.

LEE, ALVIN T. M., and MASON, JOHN. LAND USE AND SOIL CONSERVATION IN HAYWOOD COUNTY, NORTH CAROLINA. N. C. Agr. Col. Dept. Agr. Econ. AE—Info. Ser. 17, 12 pp. July 1948.

N. C. Agr. Col., N. C. Agr. Expt. Sta., and Bur. Agr. Econ. cooperating. A progress report designed to help in answering questions as to the nature and extent of participation in the agricultural conservation program. Based upon data from a sample of 425 farms, or about 15 percent of the total farms in this county.

MCKAIN, WALTER C., JR., and FLAGG, GRACE L. DIFFERENCES BETWEEN RURAL AND URBAN LEVELS OF LIVING. PART II. REGIONAL VARIATIONS. 12 pp. Bur. Agr. Econ. June 1948.

The second of a series which shows differences in levels of living between farm and urban people. Regional variations as between North, South, and West in those elements for which measures are available are presented.

MULLINS, TROY. HARVESTING BY COMBINE AND DRYING NETS PROFIT TO RICE GROWERS. Ark. Agr. Ext. Econ., May–June 1948, pp. 1–3. [Printed.]

Reports on preliminary data relating to 1947 threshing costs obtained in a recent survey of 155 rice farms. The study was made by the Arkansas Agricultural Experiment Station in cooperation with the BAE.

O'DONNELL, P. E. CONSUMPTION OF FLUID MILK AND CREAM IN NORTHEASTERN MARKETING AREAS. 53 pp. Bur. Agr. Econ. October 1948.

Strictly speaking, this is a report of sales of fluid milk and cream in certain markets rather than a report on consumption. Actual consumption is likely to be somewhat less than reported sales. Covers the period February 1945 through 1947. (A report under the Research and Marketing Act).

REUSS, L. A., WOOTEN, H. H., and MARSCHNER, F. J. INVENTORY OF MAJOR LAND USES IN THE UNITED STATES. U. S. Dept. Agr. Tech. Bul. 663, 89 pp. 1948. [Printed.]

Gives extent and distribution of major agricultural land uses and general analysis of land use situation in the United States. Shows latest data available for both land in farms and outside farms. Information on acreages of land devoted to chief purposes gives comprehensive picture of all land in the U. S., trends in land use, and elements affecting use.

STRAND, EDWIN G. SOYBEANS IN AMERICAN FARMING. U. S. Dept. Agr. Tech. Bul. 966, 66 pp., illus. November 1948.

Outlines expansion of soybean production in this country, appraises the forces bringing it about, and evaluates factors that may influence the future competitive position of soybeans in American farming. (Results of a project under the Bankhead-Jones special research fund.)

TAYLOR, CARL C., DUCOFF, LOUIS J., and HAGOOD, MARGARET JARMAN. TRENDS IN THE TENURE STATUS OF FARM WORKERS IN THE UNITED STATES SINCE 1880. 36 pp. Bur. Agr. Econ. July 1948.

An analysis of the operation of the so-called agricultural ladder. Estimates were developed for male farm workers 20 years of age and over. Major conclusion: A general decline in tenure status between 1880 and 1940 in almost every part of this country.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. INDEX NUMBERS OF LIVESTOCK AND POULTRY ON FARMS AND RANCHES JANUARY 1, 1867-1948 AND ANIMAL UNITS OF LIVESTOCK FED ANNUALLY 1920-48. 9 pp., illus. November 1948.

Presents 4 series of index numbers of livestock and poultry on farms and ranches January 1, together with 2 series of animal units of livestock (including poultry) fed annually. BAE is discontinuing preparation of the 4 series of animal units on farms January 1 heretofore presented in Agricultural Statistics and elsewhere.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. POTATO PREFERENCES AMONG HOUSEHOLD CONSUMERS. U. S. Dept. Agr. Misc. Pub. 667, 119 pp. August 1948. [Printed.]

Provides a base of information for development research. Describes consumer preferences in detail to help growers decide the kind of potatoes to produce and how to prepare them for market; and to help distributors improve merchandising practices. (Based on a survey conducted under the Research and Marketing Act of 1946.)

UNITED STATES BUREAU OF THE CENSUS AND UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. GRAPHIC SUMMARY OF FARM TENURE IN THE UNITED STATES. Cooperative report. 40 pp. U. S. Gov't print. off., Washington, D. C. 1948. [Printed.]

Provides a graphic presentation of the extent and general nature of the various forms of tenure under which farms are held and operated. Particular attention is given to changes that occurred during the World War II period, although factors affecting trends since 1880 are included.

UNITED STATES DEPARTMENT OF AGRICULTURE. IRRIGATION AGRICULTURE IN THE WEST. U. S. Dept. Agr. Misc. Pub. 670, 39 pp., illus., partly colored. November 1948. [Printed.]

This publication is concerned with the important role that irrigation plays in the agriculture of the United States, and with its possibilities and problems. The author line states that it was prepared in BAE. Elco L. Greenshields of BAE had the primary responsibility in the preparation of the report and Robert F. Turnure, BAE, supervised the drafting work.

WINTER, E. P. MARKETING MARGINS AND COSTS FOR POULTRY AND EGGS. U. S. Dept. Agr. Tech. Bul. 969, 70 pp. illus. November 1948. [Printed.]

One of a series dealing with farm-retail price spreads and their break-down into marketing margins and costs. Data are for the year 1939 and show the normal peacetime distribution of costs of marketing poultry and eggs. Worth while as a bench-mark from which to measure later changes.

Statistical Compilations

DUCOFF, LOUIS J., amd HAGOOD, MARGARET JARMAN. THE HIRED FARM WORKING FORCE OF 1947. 16 pp. Bur. Agr. Econ. July 1948.

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